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The members of the Society meet each spring for an annual subscription dinner. There are also occasional afternoon receptions held in the rooms of the Society, at which are shown special collections of photographs and other objects of geographic interest.

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Second Expedition to Yakutat Bay, Alaska.[1]

RALPH S. TARR.
Professor of Dynamic Geology and Physical Geography,
Cornell University.

Yakutat Bay has been visited by more geographical expeditions than any other point on the Alaskan coast, with the possible exception of Muir Inlet. This fact is due to two causes: (1) Because the great ice plateau of the Malaspina Glacier has offered an excellent route for approach to Mount St. Elias by parties endeavoring to ascend that peak; (2) because the Malaspina and other glaciers have features of unusual interest to students of glaciers and glacial action.

Several expeditions, having for their object the ascent of Mount St. Elias, have crossed the Malaspina Glacier from the ocean side. This was the route chosen by Professor Russell on his second expedition (1891); but on his return he skirted the margin of the Malaspina on both the Pacific and Yakutat Bay sides. In his first expedition (1890), however, Professor Russell made his start from Yakutat Bay. In 1897 two expeditions, one under the direction of Prince Luigi Amadeo, Duke of the Abruzzi,[2] the other in charge of Mr. Henry G. Bryant of Philadelphia, crossed the Malaspina Glacier from the Yakutat Bay side, entering at the Osar River near the mouth of Yakutat Bay.

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[1] Published by permission of the Director of the United States Geological Survey. I take this opportunity of expressing my appreciation of the valuable assistance rendered me in 1905 by Lawrence Martin and B. S. Butler; and in 1906 by B. S. Butler, O. von Engeln, J. L. Rich and R. R. Powers.

[2] The Ascent of Mount St. Elias. By H. R. H. Prince Luigi Amadeo di Savoia, Duke of the Abruzzi, 1900.

All these expeditions have contributed to our knowledge of the remarkable glacial phenomena of the St. Elias region, but none have equaled in this respect the results published by Professor Russell.[3] One fact established by all the expeditions is that the Malaspina Glacier formed an excellent highway for travel, being admirably adapted to sledging, and consequently to the support of a party engaged in extensive exploration.

Besides the Malaspina Glacier and its numerous tributaries from the high mountains, the Yakutat Bay region possesses many smaller glaciers, three of which descend to the bay and discharge icebergs into it. The largest of these, the Hubbard Glacier, has a much longer ice cliff rising above the fiord than that of the Muir Glacier. One of the published results of Russell's expeditions was a description of the glacial phenomena of Yakutat Bay. The Harriman expedition of 1899 also entered the bay, and the work of Dr. G. K. Gilbert forms an important contribution to our knowledge of the glaciers and glaciation of this interesting region.[4]

My own studies in and around Yakutat Bay began in the summer of 1905, when I had charge of an expedition sent by the United States Geological Survey for the purpose of further investigation of the geology and physiography of Yakutat Bay and vicinity. The results of this expedition[5] led to a desire to continue the investigation westward along the base of Mount St. Elias, following Russell's route of 1890 for part of the distance, then striking westward to the western margin of the Malaspina Glacier. The crossing of the Malaspina from east to west had never been undertaken, but it seemed to be perfectly feasible, the only possibility of failure apparently being on the western side, where the glacier comes down to the sea and forms the ice cliff of Icy Cape. Concerning this

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[3] Nat. Geog. Magazine, Vol. III, 1891, pages 53-203; Thirteenth Annual Report U. S. Geol. Survey, 1891-2, Part II, pages 1-91.

[4] Harriman Alaska Expedition, Vol. III, Glaciers, 1904, pages 45-70.

[5] Tarr and Martin, Bulletin Amer. Geog. Soc., Vol. XXXVIII, 1906, pages 145-167.

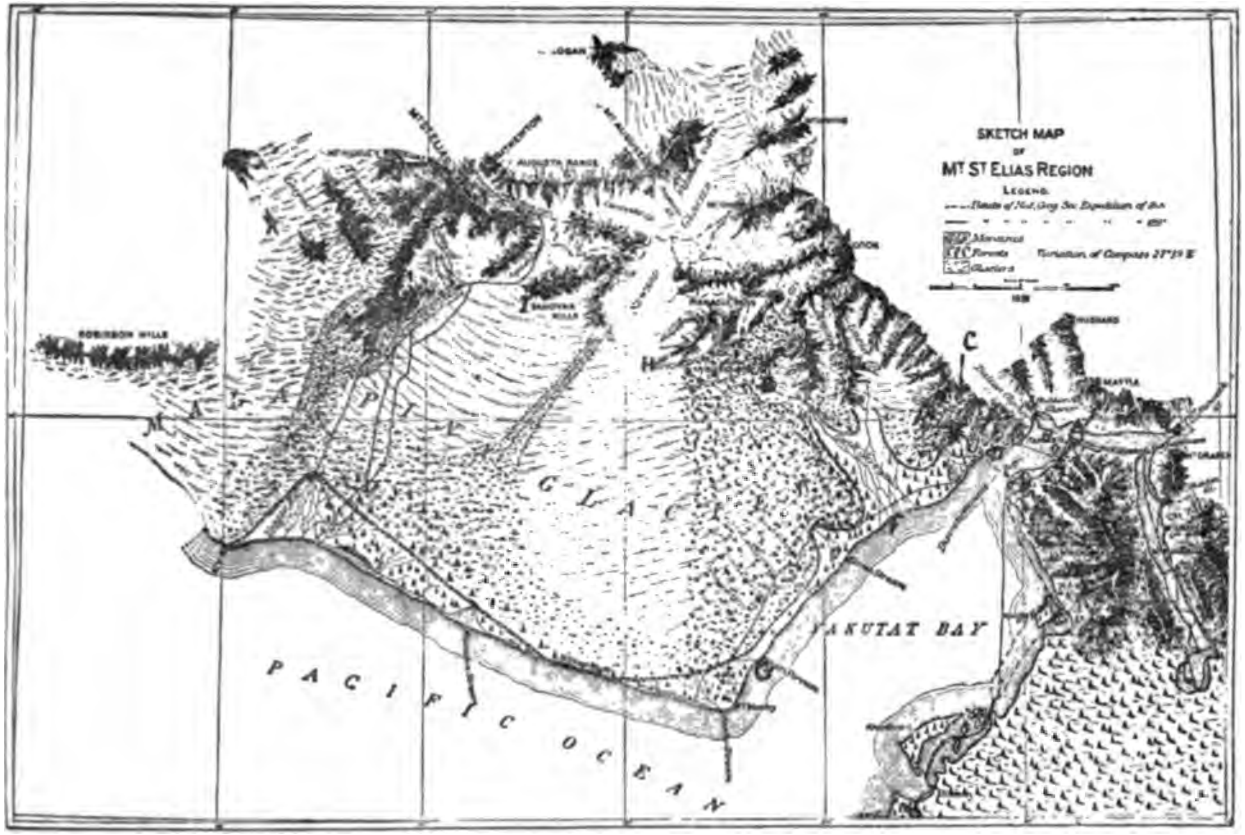

Fig. 1. Professor Russell's map of Malaspina glacier. Advancing Orange glacier at (A); advancing unnamed glacier near Turner (Dalton) glacier at (B); advancing Atrevida glacier at (C); advancing Marvine glacier dotted. Russell's route in 1890 shown by broken line; our route as proposed lay along this from (D) to (E), thence westward past (H) and (I). Route actually followed from (F) to (E) with a trip back to (K). Abruzzi went from (G) to (H) and Bryant from (G) to (I). At present ice between (G) and (F)—the route followed by Russell in 1891—is impassable.

part of the glacier, I was unable to obtain definite information; but the rest of the route had been explored, and possibility of failure there was not even considered. Nevertheless, owing to the remarkable changes recorded below, this part of the route, which in previous years had been so easily traversed, interposed an insuperable obstacle to the proposed crossing of the Malaspina Glacier.

With a party of thirteen associates and packers, six of the latter Indians, I was landed on the eastern side of Yakutat Bay early in the morning of June 23, 1906. The first few days were spent in moving camp to the west side of the bay and in making preliminary arrangements for starting on our journey over the ice. As soon as this was done, I started with one companion on a reconnaissance trip of several days, to lay out in detail the route to be followed in packing our outfit across to Blossom Island, intending while this packing was going on to make a trip up the bay in order to complete some observations begun the previous summer. The route upon which we started was almost exactly that which Professor Russell had followed in 1890. Moreover, in the summer of 1905 I myself had gone over a part of the route (nearly across the Atrevida Glacier), and had sent two of my party, Messrs. Butler and Martin, across the Atrevida and Lucia Glaciers and through Floral Pass to the Hayden Glacier. Thus, in August, 1905, we knew this route to be a perfectly feasible one for packing, and had no expectation of any material change in so short a period.

Judge our surprise, therefore, when approaching the edge of the Atrevida Glacier, to find that it had changed absolutely in a period of ten months. The margin facing Yakutat Bay, which in August, 1905, was moraine-veneered ice of moderate slope, up which we easily walked, was now a vertical ice cliff crowned with jagged pinnacles and cleft by deep crevasses. The ice tunnel from which the glacial stream had emerged was now further toward the sea by over a hundred yards; the ice was advancing into the forest; and the alder thicket, which covers the lower end of the glacier, was torn by great rents into which the moraine and vegetation were falling. From the steep ice front stones were constantly rattling down, burying

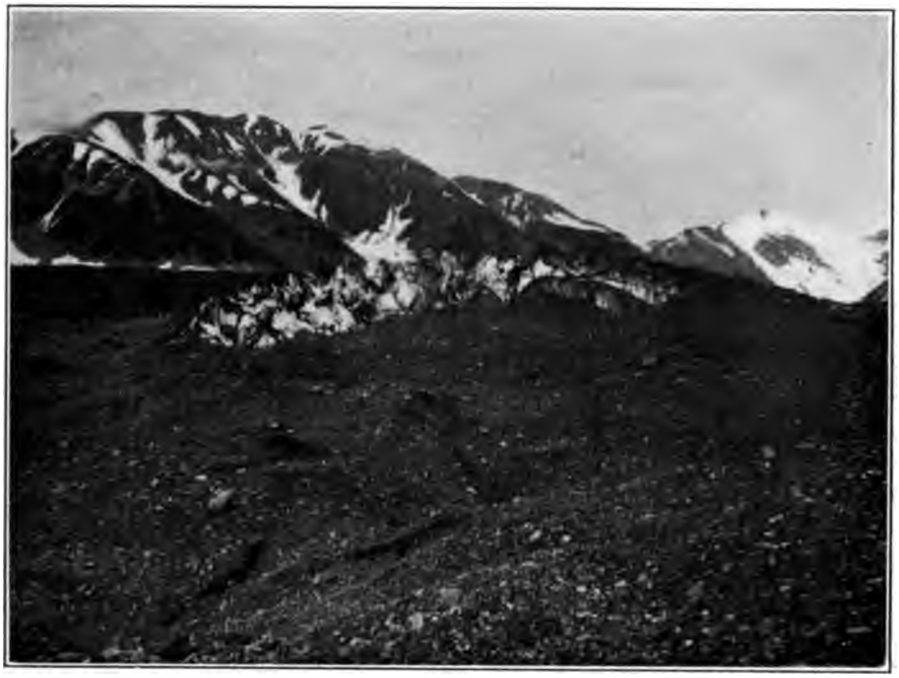

FIG. 2. A view over the moraine-covered surface of the Atrevida glacier, August 20, 1905. Taken near middle of glacier to show an exceptional area of crevassing, then interpreted as due to a buried rock hill, but now believed to represent a first stage in the great advance which has since occurred. Compare with Fig. 3.

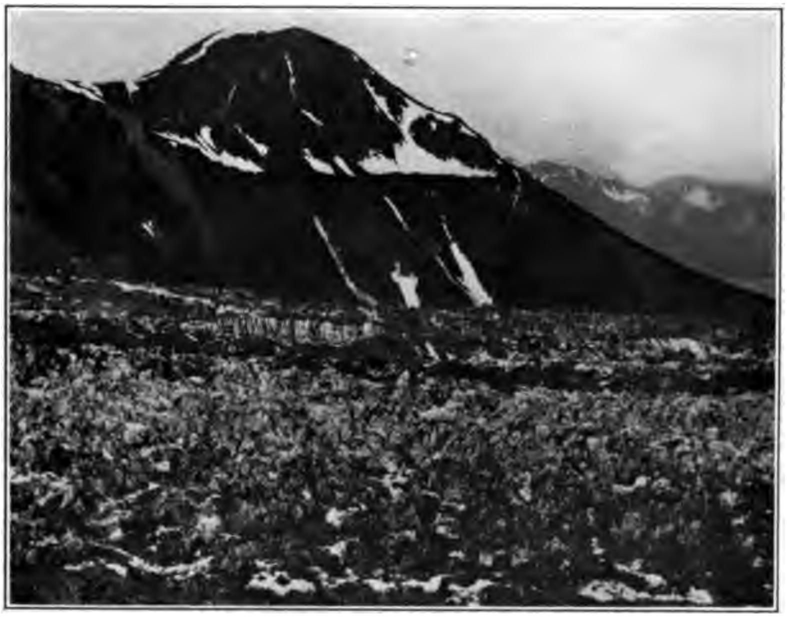

FIG. 3. Photograph (with long-focus lens) to show sea of crevasses in Atrevida glacier. Looking eastward across the Atrevida glacier from Terrace Point, August 2, 1906. The view in Fig. 2 was taken from a point about half way across the glacier, looking toward the camera station of Fig. 3. On August 20, 1905, the only notable crevassing in this entire area was that shown in Fig. 2.

the forest beneath morainic debris; the ice cliff was broken by thrust faults; great blocks of ice were occasionally falling from the front, so that even an approach to the cliff was dangerous; and the ascent of the cliff could be made only by great labor and with the aid of ice axes.

Our entrance along the route which we had so easily followed the previous summer was thus completely cut off. Thus barred, we turned back in amazement which amounted almost to stupefaction. It seemed utterly incredible; and, so far as I can now tell, such a change is entirely unprecedented. Thinking that there might perhaps be some other route by which we could enter upon the ice, and that possibly by some roundabout course we might cross the Atrevida Glacier, we went the next day to the crest of a low mountain which rises directly above the eastern side of the Atrevida Glacier. From this point of view, which overlooked the entire Atrevida, it became evident that there was no route across this glacier by which we could hope to pack our outfit; and, in fact, it seemed probable that even a party unburdened could not hew its way across.

In 1905 this glacier consisted of three parts: (1) A stagnant expanded ice foot, outside of the mountains, which was covered with a dense alder growth; (2) an upper valley portion nearly clear of morainic debris, and only slightly crevassed; and (3) an intermediate portion of moraine-covered ice on which there was very little vegetation in the form of scattered alders and willows. In 1906 the clear upper portion was pinnacled by crevasses and melting; the intermediate portion was broken by a sea of crevasses into which more than half of the morainic veneer had tumbled, revealing the clear ice where in 1905 there was practically none in view; and the alder-covered end, a bulb-shaped area at least twice the width of the glacier in its valley portion, was broken by a series of concentric crevasses revealing rings of clear ice in the alder thicket.

Over beyond the Atrevida Glacier the Lucia could be seen coming out of its mountain valley from the base of Mt. Cook, sweeping past Terrace Point and coalescing with the crevassed and altered Atrevida. So far as could be seen from the mountain top, the Lucia Glacier had not changed since it was crossed by our party in August, 1905; and later explorations proved this to be the case. Thus there are two neighboring and coalescing glaciers, one of which shows a remarkable and unprecedented breaking, while the other has suffered no perceptible change.

Baffled in our attempt to follow the route chosen, we decided to go around the end of the Atrevida Glacier, along a more difficult route, up the valley of the Kwik River, the great glacial stream which carries the waters from the Marvine, Hayden and Lucia Glaciers. If this route could be followed it would take us along the path originally chosen, with the exception of the first portion of it, and the larger part of that could be visited by a backward journey across the Lucia Glacier to the western margin of the Atrevida Glacier. Accordingly, directions were given to the packers to move the camping outfit to the Kwik Valley, and to carry our supplies up that valley to the Hayden Glacier, where we expected to be able to begin sledging.

In the meantime, my scientific associates[6] and I made a boat trip up Yakutat Bay to the head of Russell Fiord. Here we found a remarkable change in two of the glaciers since our visit the previous year.[7] The Turner Glacier was in approximately the same condition as in 1905, but a small unnamed glacier a quarter of a mile north of the Turner had suffered a remarkable change. Late in August, 1905, it terminated some distance from the sea in a moraine-covered, apparently stagnant end. It was then wholly separated from the Turner Glacier; and its lower portion was completely covered by black shale fragments. By June, 1906, this glacier had advanced into the sea, spreading out fan-shaped and coalescing with the Turner Glacier, thus extending the continuous ice cliff of the Turner Glacier at least a mile to the northeast. This new addition to the Turner Glacier ice cliff is badly crevassed, and the ice back of it is also broken and pinnacled; but the surface is still well blackened by its morainic veneer.

About a half mile further north is another glacier similar to this one. But it has not changed perceptibly since 1905, and still ends some distance from the water.

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[6] Messrs. B. S. Butler, J. L. Rich, O. von Engeln, and R. R. Powers.

[7] For a map showing the glaciers of this bay see Bull. Amer. Geog. Soc., Vol. XXXVIII, 1906, opposite p. 145.

The Hubbard Glacier, the next up the fiord, seems to have advanced slightly, if at all; but until we can compare our photographs, it is impossible to make exact statements on this point. Just east of the Hubbard, however, there is a glacier which has changed remarkably. This we named the Orange Glacier in 1905, and gave to it a rather careful study because of the fact that the morainic phenomena on its stagnant, bulb-shaped terminus were of unusual interest. In August, 1905, we walked freely over this bulb-shaped terminus and ascended the Orange Glacier to a distance of five or six miles from the sea. It has changed absolutely; the interesting concentric moraines are completely destroyed; the ice is profoundly crevassed; and it was not found possible even to enter upon this glacier which in 1905 was easily traversed from the sea up to the snow line. No other glaciers in the fiord show any notable change.

On our return from the trip up Yakutat Bay, we proceeded to the mouth of the Kwik River, up which our packers had been carrying provisions and necessary camping outfit, including a sled, which we expected to use in crossing the Malaspina. We found that our packers had made fairly good progress, having our supplies moved to the base of the Hayden Glacier. But the work had been difficult and necessarily slow. The Kwik is made by the union of two very large and swift glacial streams to which are added many smaller ones. It quickly branches and subdivides into a large number of distributaries, spreading completely over a broad alluvial fan. The packers were obliged to cross scores of these branches, some of them of such swiftness as to render the crossing difficult and even dangerous. The streams were ever changing in position and in depth, so that at no two trips were the conditions the same. Added to the difficulties of fording miles of glacial waters was the presence of quicksands in the lower course of the Kwik.

The treacherous character of the Kwik River was brought clearly to our attention by an accident which came very near bringing an end to our exploration in its very earliest stages.

The packers had cached most of the provisions and camping equipment near the banks of a moderately large distributary of the Kwik in what seemed to be a perfectly safe position. Early in the morning, as they approached this cache to move it across to the other side of the stream, they saw it tumbling into the river. Much of the material was saved, but a great deal was lost. That which we missed and mourned the loss of most was fifty pounds of Wilbur's milk chocolate, which we had taken along for luncheons when on the march. Later we found that this disaster was probably due to the bursting of an ice-dammed lake in the headwaters at Blossom Island.

By the time we had come up with the packers, it had become evident that our crossing of the Malaspina Glacier was probably not to be accomplished. The margin of the Malaspina, which forms the western side of the Kwik Valley, and whose supply of ice is derived from the Marvine Glacier tributary, was found to be greatly crevassed and broken by a recent movement similar to that previously discovered in the glaciers mentioned above. This crevassing was found to extend southwestward along the shores of Yakutat Bay, as far as could be seen from the mouth of the Kwik. Later exploration along this coast as far as Point Manby showed that the crevassing extends at least that far. It is along this ice front, sometimes on the ice, sometimes on the moraine in front of it, that Professor Russell made his retreat to the entrance of Disenchantment Bay in 1891. His march was made with no great difficulty; but at the present time such a journey would be entirely impossible. Our later visit to Point Manby proved that the route by which the Duke of Abruzzi and Mr. Henry G. Bryant entered upon the Malaspina Glacier, is now closed. The entire face of the ice is now frightfully broken and crevassed.

Where we skirted the margin of the Malaspina Glacier, close at hand, as we did along the western side of the Kwik Valley, we found that the crevassing was still in process of development during our visit. During many years of stagnation the ice had become buried beneath a thick covering of morainic debris, forming a soil in which alder and cottonwood

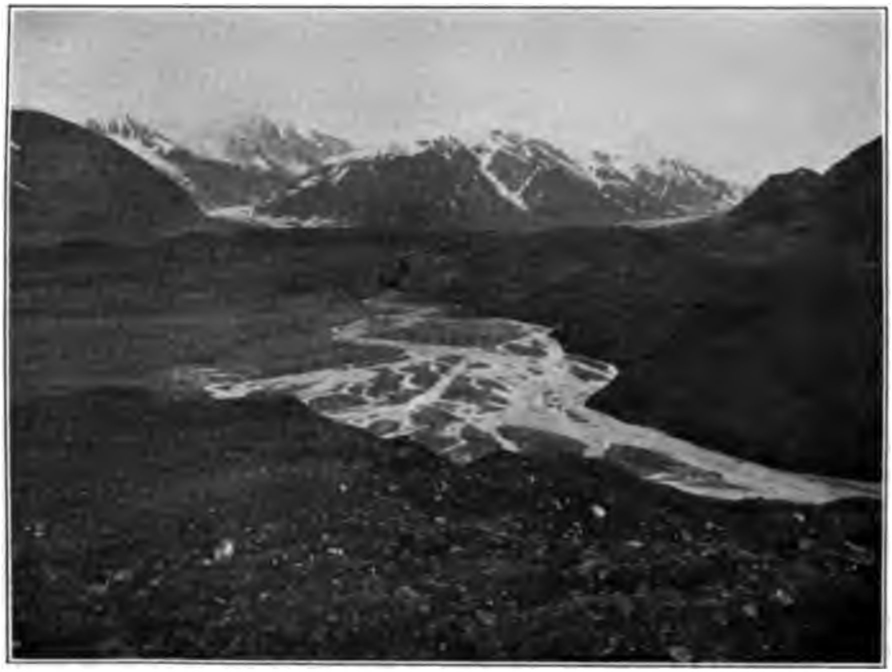

FIG. 4. The Orange glacier from the moraine-covered ice of the outer part of its bulb-like expansion, August 8, 1905. The view looks across an alluvial fan built in a depression on the ice. A glacial stream emerges from a rock gorge. Behind it rises moraine-covered ice, and behind that (on the left) the winding Orange glacier which is so smooth that we walked up to the bend in the distance in a half day.

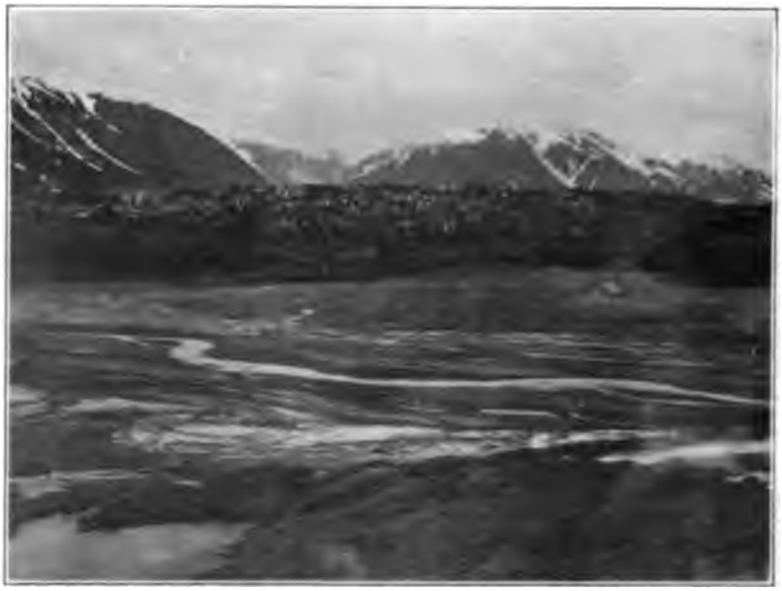

FIG. 5. Photograph, August 17, 1906, from nearly same point as Fig. 4 (about seventy-five feet lower, and a few hundred yards further to the left). The Orange glacier is now crevassed at least as far as the bend. Its moraine-covered terminus is very much higher and nearer. It has advanced over and buried the rock gorge, and a stream no longer emerges at this point. Much clear ice is shown in the crevassed bulb where a year before from this distance no ice whatsoever was visible through the moraine.

thickets had taken root. In the spring of 1906 the alder and cottonwood trees developed their leaves as usual; but for many of them it was their last spring season. The forward thrust has broken the ice into blocks, separated by yawning chasms, into which large numbers of the trees have fallen. Many of these had the color of autumn, but none, so far as we could see, had failed to develop leaves before their uprooting. We assume, therefore, that the forward thrust and breaking of the ice had its beginning after the leaves were developed.

That this part of the Malaspina Glacier was advancing during our visit, we had abundant evidence. Fragments of ice fell from the front as we passed it; the morainic soil was constantly sliding down the ice front and into the crevasses; muddy glacial torrents were developing where none had existed before; again and again trees were seen to fall; and in the month which elapsed between our first passage of this ice margin and our return, the face of the glacier was absolutely changed in detail.

From a low mountain top near the eastern margin of the Malaspina Glacier, we were able to get a bird's-eye view of its eastern half, from the sea back to the mountain base. From here it became evident that the only chance of getting to the western side of the Malaspina Glacier lay in a possible route past Blossom Island up the margin of the Marvine Glacier, and thence along the mountain base to the west. There seemed little hope of even this, however, for as far as we could see up the valley of the Marvine there was a perfect sea of crevasses; and from this point down to Yakutat Bay and Point Manby the Malaspina Glacier was completely impassable for packing purposes at all points.

We pushed on to Blossom Island across the Hayden Glacier, which shows no change from its condition in 1905. And from Blossom Island we made a trip back across the Hayden Glacier through Floral Pass and across the Lucia Glacier to Terrace Point, at the western margin of the Atrevida Glacier. From this point our first observations, which were made on the eastern side of the glacier, were amply verified. No one could now possibly cross this glacier with supplies, although in the preceding summer there was no greater difficulty in crossing it than there was in 1906 in crossing the Lucia Glacier.

From the summit of Blossom Island, and from a short trip as far up the margin of the Marvine Glacier as we could go, we saw plainly that that route westward was also cut off. This short excursion was along the path which Russell followed in his first attempt to ascend Mount St. Elias. He mentions no special difficulties in his way in this part of the journey, and from the rapidity of his march, as well as from his description, it is evident that the conditions of to-day were not then present. He could not have carried his supplies up the margin of the Marvine Glacier, nor could he have crossed the glacier where he did had the conditions approached those of 1906.

Our view from the summit of Blossom Island showed clearly not only the condition of the Marvine Glacier, but of the Seward Glacier where it comes out of its mountain valley and spreads out to join the Marvine, forming the eastern part of the Malaspina ice plateau. This glacier is not crevassed to the extent that the Marvine is, but nevertheless it is decidedly broken, and from a distance looks impassable. Benno Alexander, a member of my party, was with the Duke of Abruzzi on his ascent of Mount St. Elias, and he states that from the view which he obtained from the summit of Blossom Island, he is convinced that the Seward Glacier is decidedly changed from its condition in 1896. He sledged over this route again and again, but, as viewed from the summit of Blossom Island the glacier seems now to be in such a condition as to making sledging over it impracticable. The Seward Glacier, therefore, seems to be advancing, but its advance has not proceeded far enough to so completely break that part of the Malaspina which it supplies as the advance of the Marvine has done to its lobe of the Malaspina. It will be interesting to know whether this apparent advance of the Seward Glacier continues, and whether its effect in the next year or two is felt down to the sea.

That there has been a remarkable change in some of the glaciers of the Yakutat Bay region there is no question. That this change has for the most part, if not entirely, occurred during the past year, is clearly proved by our comparative observations of 1905 and 1906, which include all the glaciers that have advanced, excepting the Marvine, which we did not actually visit in 1905. Even in this case, however, we examined the glacier from a distance with field glasses and failed to detect any notable crevassing, although in 1905, from the same points of view, the broken condition of the glacier was very evident. It is certain, too, that this change is still in progress, the wave of advance not yet having died out.

The recent forward movement recorded in these glaciers is spasmodic and of decided extent, being sufficient not merely to break up glaciers enclosed in mountain valleys, but also to introduce crevassing in a broadly expanded ice foot which has been so nearly stagnant, and for such a long time, as to permit the accumulation of a deep morainic soil, and, near the margin, the growth of trees a full half century old.

In accounting for this phenomenon the above facts must be explained; and, in addition, it is necessary to account for the fact that, while some glaciers are thus affected, others, even the nearest neighbors, have not yet been influenced by the cause which has produced the wave of advance. Moreover, it is necessary to take into consideration the fact that some of the advancing glaciers are very small and short, others large and long. In seeking an explanation for these remarkable changes, there is, so far as I am aware, no guide from previously described occurrences. The advance seems to be totally different from those which are associated with climatic variations, by which a slow forward movement is caused without further notable changes in the glacier.

All excepting one of the possible explanations that we have been able to suggest have been considered and discarded as incapable of explaining the facts. The single hypothesis against which no facts are opposed, and which seems the most rational explanation of the phenomenon, is that of earthquake effect. In the autumn of 1899 this region was visited by a succession of earthquake shocks of exceptional vigor, during which the coast line was uplifted throughout most of the area of Yakutat Bay, the uplift of the coast in one place having been more than forty-seven feet.[8] During this earthquake the region was violently shaken not only once, but many times; and, from the descriptions of eye-witnesses, as well as from evidences which are still apparent, it is certain that in many places great masses of rock were thrown down the mountain-sides as avalanches. There must also have been a great down shaking of snow and ice from the steep slopes among which these glaciers were fed.

The hypothesis which is proposed to account for this advance of the glaciers is that during the earthquake an exceptional mass of snow was caused to descend into the valleys of the glaciers in the Yakutat Bay region. This great accession of snow supply started a marked wave of advance in the glaciers, which has broken up the rigid ice into the condition of the present, and has been sufficiently powerful to push forward and break up the bulb-shaped terminus of several of the glaciers. The reason why some glaciers do not show the effect of this impulse may be sought in two directions: First, in some cases the wave has not yet reached far enough down to produce the effect which has just arrived in those glaciers described; secondly, some glaciers did not have the necessary kind of slopes and amount of snow in unstable condition to bring about a sudden forward movement.

This explanation of the phenomenon as an earthquake result at first sight seems to demand a more rapid forward movement of the wave than would be expected from our knowledge of waves of advance related to climatic variations. It is, indeed, considered possible that the advance at present in progress is not related to the earthquake of 1899, but to some previous shock of equal or greater violence. On this point we have no facts to present; but it should be noted that the wave of advance in this case is quite different from that observed as the result of climatic variations. This may be illustrated by reference to a specific case. The Atrevida Glacier has in nine months been completely broken from near its head almost down to its terminus, a distance of not less than six or

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Tarr and Martin, Bull. Amer. Geol. Soc., Vol. XVII, 1906, pages 29-64.

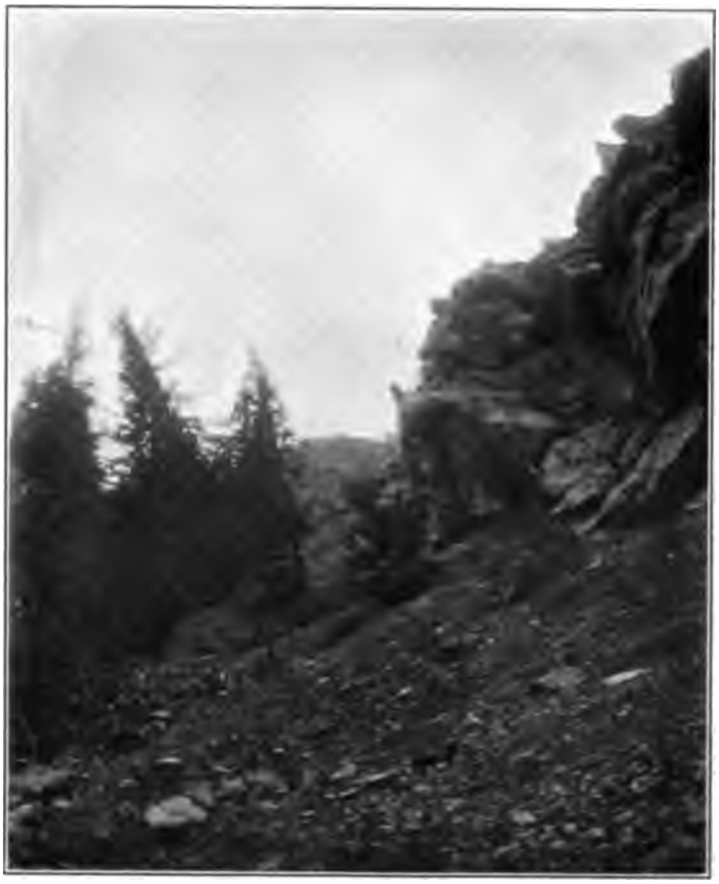

FIG. 6. The ice cliff (on the right) at the margin of the Atrevida glacier, July 10, 1906. From this broken ice point stones and blocks of ice were constantly falling and the forest is being destroyed.

seven miles. The entire appearance is that of a great shove from behind, breaking a rigid and resisting ice mass in front. In a wave of advance due to ordinary slow climatic variations, the impulse is slowly transmitted down the glacier to its end. But a great wave such as might be expected to result from a sudden and enormous addition of snow to the reservoir, would give an impulse which, applied to the resisting, rigid ice in front, might well cause a spasmodic crushing and forward movement far down the glacier, thus rapidly outrunning the progress of a normal wave of advance.

Our disappointment in our failure to carry out the exploration as originally planned, was largely overcome by our opportunity to study this remarkable change in the glaciers. We spent our time, therefore, in an examination of this phenomenon instead of in a march westward across the Malaspina Glacier; and when this was done we started down the valley of the treacherous Kwik, fording its many threads of ice-cold torrents, passing over its quicksands, and finally crossing the surf-beaten bar which guards the entrance to the mouth of this heavily sediment-laden river.

Naturally, in such an expedition there were many incidents and excitements. Two of these had special bearing upon the expedition, since they caused the destruction of some of our most valuable photographic records. In the first of these, two of us were crossing the Kwik River alone when one was swept off his feet, and started on a journey in the ice-cold torrent toward a glacial tunnel under which the Kwik flows for seven miles. His companion pulled him out, but his camera proceeded on the journey and was never seen again. The second incident, lower down in the Kwik Valley, occurred when six of us were crossing the river together, holding to a stout pole in order to increase our stability in fording the rushing current. The man up-stream was swept off his feet, the next three went down like ninepins, and two of us were rolled on down in the icy current, where we remained for five minutes before, chilled to the bone, we were drawn out by one of the packers. One of us had the misfortune to have upon his back, among other things in his sixty-pound pack, the entire series of photographs that had been taken in the study of the Malaspina Glacier. Although supposed to be in waterproof packages, these were badly water-soaked and many of them absolutely ruined. Nevertheless, enough were obtained to show clearly the remarkable conditions which have been described.

The Malaspina Glacier has, since its first description by Russell, been one of the best known glaciers and the finest example of a nearly stagnant Piedmont Glacier. In its eastern part it is no longer what it was. It has started upon a new life, the end of which no one can predict. It should be watched with care, for it has many lessons of importance to reveal. It will be of the highest value to students of glaciers and glacial phenomena to have the Malaspina Glacier made the basis of a study each year for the next few years, or until such time as the present forward movement has ceased.

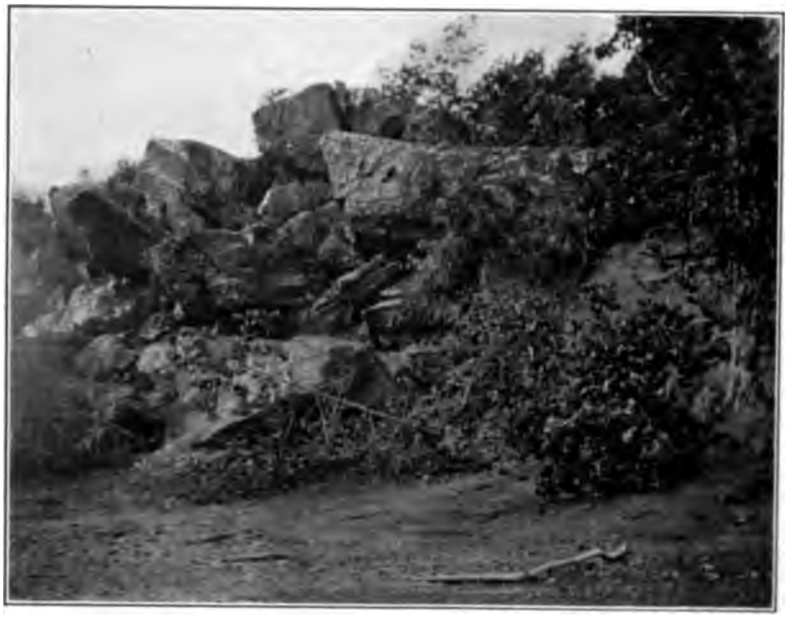

FIG. 7. Margin of the Malaspina glacier on the west side of the Kwik Valley, August 11, 1906. The broken blocks are ice fragments produced by the forward movement and breaking of the glacier margins. Note the tumbled trees (in leaf) on and in front of the jagged ice cliff.

A Study of London:

An Essay in Human Geography.[1]

EMORY R. JOHNSON,
Professor of Transportation and Commerce, University of Pennsylvania.

Geography has been defined by many learned men—the number of definitions corresponding closely to the total number of geographers—but I know of no better statement of the real nature and content of the subject than the old and familiar one that "geography is the study of the earth as the home of man." Such a definition, it is true, cannot lay claim to scientific precision, because it does not closely delimit geography from other sciences; but while the definition does not mark out distinct boundaries, it denotes clearly what is within the field; it is accurately descriptive of the subject matter of the science.

Geography is a science still in evolution. A generation since the subject matter of geographical treatises was chiefly descriptive and political. Little attention was or could be given either to the earth's physiography or to the casual relations between physical environment and the life of man, until the advance in the science of geology provided the data for developing the physical side of geography. That having been done, numerous men of geological training became workers in geography, and the sub-geographical science of physiography made rapid progress. Meanwhile, oceanography and climatology were being developed also by men whose training and interests were mainly in the natural sciences. The study of the physical phenomena of the earth made gratifying headway, but the enthusiastic geographers gave comparatively little attention either to man or to other forms of life. The human side of geography and the living responses to physical conditions were relatively neglected. Geography was in danger of becoming a purely physical science, part of, and subordinate to, geology and physics.

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[1] President's annual address to the Society, November 7, 1906.

The first effective protest against this neglect of the human side of geography was made by economists and men of affairs whose scientific and business needs led to the development of commercial geography and later to the beginnings of the larger subject of economic geography. Here again the investigators and writers failed to see their subject in its true perspective. As statisticians and economists they concerned themselves with the human side of geography and neglected the consideration of the physical conditions that control life, and, of course, did little to correlate earth and man.

The science and study of geography seem now to be entering upon a new phase. There are numerous evidences of the proper appreciation and union of the human and physical elements of the subject. The physiographer is becoming an economist, and the economist is giving attention to the physical control of human affairs. The study now being made of regional geography and the fact that the investigators in that field are concerning themselves as much with the living responses as with the physical phenomena of the areas they are investigating is a most significant indication of the progress of geography. The love of adventure and the glory of achievement will bring about the exploration of the unknown parts of the world; the geologist will continue to interest himself in the earth's physiography, the economist, biologist and botanist will carry on their studies of life, but the progress of geography might still be slow without the work of those who are interested equally in man and the earth. Fortunately, present-day geographers are giving increasing evidence of their ability to grasp their subject in its entirety, and are thus realizing the ideal of geography as a study of the earth as the home of man.

The annual addresses of the presidents of your Society have usually portrayed the triumphs of exploration, and your Society may justly feel proud of the victories won by the officers and other members who have braved cold and hunger with the immortal Kane in Polar exploration, who have scaled snowy summits in Alaska and Mexico or have fearlessly gazed into seething craters of active volcanoes in Martinique and elsewhere; but an address upon some other topic seems necessary this year. At the last election of officers you chose a president, whose ambitions have not made him a mountaineer, nor have his scientific interests drawn him so strongly towards geology or physiography as might be wished. Economics and history and the present-day affairs of men have been his chief delights, but his affection for those subjects have not taken him away from geography. They have, on the contrary, caused him to regard the study of geography as essential to successful work in his chosen field.

A love for economics impels one towards geography as powerfully as does a love for the earth; but sustained affection for geography has been the result of the belief that teachers, writers and our own Society might well give slightly more attention to *man* as an object of geographical inquiry.

There are various reasons why a subject for this address was selected from the field of human geography. Other speakers who are to address the Society this year will discuss the great California earthquake, describe the eruption of Vesuvius, give an account of the ascent of the highest and most inhospitable mountain in North America, and tell us how the Northwest Passage was finally successfully made. I hope, also, that we shall hear Commander Peary describe his heroic work.[1]

This address is that of a lay member in this congregation of geographers. Many of us are fortunately able to leave Philadelphia for a while each summer when the days and nights wax hot and humid. Some of us are certain to seek the Canadian Rockies, others are to be seen in Nova Scotia, Newfoundland, or Mexico, and more of us in the equally alluring seashore and mountain retreats of our own land of scenic beauty. From time to time we invade Europe. While there, we have varied emotions and experiences, most of which are delightful, and some of which are most pleasant in retrospect. Every tourist in Europe finds himself constantly asking questions of himself and others as to the meaning of, and reason for, the many things he sees. While in Europe most of our time is spent, and wisely so, in the large cities, because they epitomize the culture and the social and economic life of the countries we visit. As European tourists we seek recreation in the regions of charming or inspiring scenery, and education in the cities. After spending a delightful month last summer in Scandinavian countries, I was tempted to devote this hour to Sweden and Norway. I decided, however, that in speaking as a tourist to tourists I could accomplish more by attempting to answer certain questions that might confront one while in London.

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[1] Commander Robert E. Peary addressed the Society December 21, 1906, upon "The Field Work of the Peary Arctic Club, 1905 to 1906."

London appeals to one's economic and geographic interests with peculiar power. It is the world's largest and wealthiest city; it may not be the grandest or the noblest creation of man; but it is unquestionably his greatest. At least in the material sense; for, although the home of several valuable art collections, London is not notably famous as an art center—Rome, Florence, Dresden and Paris outrank London in art treasures; but it is the leading financial and commercial city of the world and one of the great centers of industry. London is, moreover, the political and administrative center, the heart, of the world's greatest empire. In no other city do so many forces shape the destinies of men, from no other place do so many lines of influence radiate. London is fascinating partly because it is a most difficulty city to comprehend, because it is so vast in area, so complex in organization, and is the center of so much of moment in the affairs of the world.

There is another reason which, though sentimental, is perhaps the strongest of all reasons why London appeals to the American traveler. Those of us who can look back a generation to the time when we were young will readily recall the antipathy that our countrymen—including many of ourselves—felt against our English forebears whom we refused to obey in the days of George III. Happily our antipathy has become cordiality, and I think we all feel that as Englishmen and Americans know each other better they will realize that they have common aims and like emotions, although we Americans may not always speak our mother tongue with the purest accent. The late Secretary Hay remarked in one of his charming addresses: "There is a wise French proverb 'to understand is to pardon,' and every step of progress which the peoples of the earth make in their comprehension of each other's condition and motives is a step forward in the march to the goal desired by men and angels, of universal peace and brotherhood."

A detailed survey of London obviously cannot be compressed within the narrow confines of an hour's address. You will not expect, nor would you wish, a guide book account of the city. Nor shall this address recall to your memory the many fascinating literary associations of the city where Chaucer, Spencer, Shakespeare, Johnson, Addison, Dickens, Thackeray and other great minds have enriched our language with undying classics. The Story of London has been told by many authors in many forms. No city has inspired a greater library of literature. Stow, Loftie, Wheaton, Gomme and a score of others have written London's annals, while Sir Walter Besant has glorified the history of the city with a halo of literary charm.

When one sails for Europe en route for London and begins to wrestle with the detailed description and plans in his Baedeker he can hardly avoid querying, How is it that London has come to be the largest of all cities, and Why is the world's largest city on the island of Great Britain rather than on the Continent?

Before endeavoring to explain how London has come to be so great, it may be well to refresh our memory regarding the city. London is located, as you know, on both sides of the Thames River near the head of the tidal portion of that stream about sixty miles from the open sea. In the heart of the great area is the historic old "City of London," only a little more than a square mile in extent. The Administrative County of London comprises the central part of the London district; the area of the County of London including 117 square miles—twelve less than the area of Philadelphia County. The county is, however, not all of London. The Metropolitan and City of London Police Districts include an area of 700 square miles, and this is what is usually called Greater London. Beyond the Metropolitan area, which extends from Woolwich on the east to Kew on the west, lie numerous suburban towns which would rank as cities if located elsewhere than on the rim of London. The population of the old "City" or Corporation in the heart of London, while increasingly large by day, is only 26,000 at night; in the county four and on-half million people reside, while there are about 7,000,000 people within Metropolitan or Greater London.

London occupies parts of four counties: Essex and Middlesex on the north of the Thames, and Surrey and Kent on the south. The County of Middlesex contains more of the city than is included in any of the three other counties.

The primary factor affecting the growth of any city is its site. Very much depends upon the location of one's birthplace. Philadelphians are said to have no doubt regarding this fact. A city, like a strong individual, may overcome the handicap of unfavorable environment, but good surroundings make progress much easier for men individually and collectively. London's situs was a fortunate one in the center of the Thames basin, a relatively fertile section originally covered with forests. For a thousand years after the beginning of London there were large forest areas in Middlesex and Kent. The lower levels of the Thames Valley are surrounded by ridges of chalk, the North Downs bounding the basin on the south, the Marlborough and Chiltern Hills on the west and northwest.

Originally swamps or marshes, submerged at high tide, rimmed the banks of the tidal portions of the Thames and the Lea, its principal affluent from the north. Land having an elevation of less than fifty feet stretched along both banks of these rivers, one notable exception being found on the north bank of the Thames west of the Lea. At this place the higher ground lay close to the river for some distance and formed the site upon which the city originated. For some distance back from the river the elevation was less than 100 feet. Comparatively little of Greater London of to-day is built on ground over 200 feet above the sea, consequently London, like Philadelphia, could readily expand indefinitely.

From the Hole Bourne east to the great loop in the Thames was an area between twenty-five and fifty feet above the sea, and this was the section first occupied, ***Llyn-dun,*** London, meaning a fortress by a pool or lake. The little Wallbrook formed the first port, and the first large houses were constructed along each side of this little stream. A small area within the northern part of what is now Greater London is 400 feet above the ocean, and from this section, later named Hampstead, flowed the Hole Bourne, whose lower course, called the Fleet, was along the western boundary of London—the Ty Bourne, whose two mouths inclosed Thorny Isle—where the City of Westminster was built—and the West Bourne, whose course was through what is now Hyde Park.

Another influence affecting the growth of a city is the kind of a country in which it is located, and its relation to that country. The metropolis of a country like Norway would inevitably differ in size and character from the chief city of Great Britain. Norway's mountains and inclement climate preclude extensive agriculture, and her limited supply of coal and iron prevents large manufacturing industry. Great Britain, on the contrary, is agriculturally productive, and until 100 years ago was an exporter of wheat. When her population became so dense that there was no surplus food, the rich deposits of coal and iron enabled an increasing percentage of the people to devote their energies to the development of manufactures. Thus Great Britain has been in turn prominent in the production of food and in the creation of manufactures. There has always been the economic basis for industry and trade, and consequently there has always been a commercial emporium.

London has always been the trade center of England. It was made such in the Roman days by the system of highways built by the Romans, who constructed roads radiating in all directions from London. The highway to the northwest was later called Watling Street. London is now even more the focus of the transportation system of the United Kingdom.

Practically all of the great rail lines have their main terminus in London. London's location on the Thames also makes it a favorable center of the enormous coasting trade of the United Kingdom.

The other great factors controlling the progress of a city are its relation to foreign countries and the international policy of its home country. England slopes towards the south and east; its mountains are in the west and north; it faces Europe, and its largest river, the Thames, is opposite the mouth of the Rhine and the Elbe, the two streams which drain the most important industrial regions of Europe. London on the deep tidal Thames is admirably situated for engaging extensively in the trade of Western and Central Europe. The location of the city goes far to explain why London has come to control the larger part of the European trade of the United Kingdom and of the British Empire, and even of our own country with Europe. Indeed, much of our trade with South America and Eastern Asia is carried on via London.

What has just been said partly explains why the greatest city of Europe is located on the British Isles instead of on the Continent, but a fuller explanation will readily occur to you if you will even hastily recall your knowledge of Great Britain's international policy during the past three centuries. The closing by the Turks of the direct avenues from Europe to the Orient, the discovery of an all-water route to India, and the discovery of America, shifted the centers of commerce from the Mediterranean and the Baltic to the Atlantic. Spain and Portugal were the first heirs of the new commercial heritage, but they proved incapable of administering their trust. Spain's greatness was short-lived, and she had become economically decadent even before the proud galleons of her invincible Armada were sunk or scattered by Elizabeth's seamen.

The German cities declined commercially during the sixteenth century both because of the untoward political conditions at home and because of the Atlantic-ward shifting of the world's trade. Thus Holland and England became the two competitors for commercial supremacy, and Great Britain won easily and quickly, not only because of the geographical conditions that favored her trade, but also because her statesmen were wise and aggressive. Genius as well as geography controls the destiny of nations.

During the century and a half that ended with Waterloo, Great Britain triumphed in turn over Holland and France, because the British people had previously achieved individual liberty; upon the anvil of strife against the power of kings they had forged the sword of liberty and the scales of justice. There was individual liberty, and there was a stable government strong at home and mighty in the affairs of the world.

Elizabeth's foreign policy laid the foundations for England's commercial expansion. Cromwell and his successors crippled Holland by reserving English trade and commerce to Englishmen; then when France sought to humble England there were Marlborough, and Pitt, and Nelson, and Wellington to lead the nation on to glorious triumphs. Great Britain's wars were fought to control the commerce of the world; and everywhere—except in that part of the world now called the United States—her international policy was successful. It reflected the genius of the British people, and it harmonized with geographic forces. Thus it was that the United Kingdom became the leader among nations, and its metropolis became the foremost city of the world.

London has grown great; will it continue to increase? Wide-spreading as London is, its size does not seem to check, but to accelerate, its growth. Fifty years ago its population numbered two and a third millions; now there are seven millions—three times as many. There was a gain of nearly a million during the ten years ending in 1901, and that increase will be exceeded during the present decade. Twenty-five years from now there will be more than ten million of people in London, and fifty years hence the number will reach fifteen millions. Indeed, there are clear evidences that London is entering upon a period of exceptionally rapid expansion.

One reason for believing that London is to grow rapidly is that the city is now for the first time about to have real rapid transit. The expansion of the city during recent years has been hampered by the slow transportation provided throughout the central area of the city by the horse 'buses. Numerous underground lines are now providing rapid transit within the central districts, while tramways are supplementing the steam railroads in furnishing facilities outside of the center of the city. Rapid transit will make it possible for London to grow indefinitely if there are reasons for expansion, and of such reasons there are many.

The chief factor in the growth of London is its manufactures. We seldom think of London as the great manufacturing city of the world, but the number of manufacturing plants in the area is legion. Her industries are of great magnitude and variety. The manufactures are localized to a large extent and London is an aggregation of industrial centers. The army of 400,000 people engaged in making clothing is somewhat scattered, but is to be found chiefly in East London; the 50,000 people employed in making furniture reside mainly in the northeast section; the metal workers prefer the north central district; the potteries, glassworks, breweries, tanneries and wool warehouses are in Southwark and Lambeth, south of the Thames; and so one might go through London's endless list of industries and localize them in different parts of the great urban area. These industries are waxing, not waning, and their natural progress will carry London steadily forward, provided the commercial and shipping conditions continue favorable.

London still leads the cities of the world in the value of its foreign trade and in the tonnage of its shipping. Its commerce has outgrown the facilities of the port, and many millions sterling must be spent at an early date in modernizing the harbor and shipping accommodations; but that will be done; the parliamentary and municipal governments are now working out a plan. The industrial progress of the United Kingdom and the British Empire, the growing commerce of Great Britain with its colonies, with Europe, America and the Orient will certainly cause London's trade to expand decade by decade.

The growth of London is due not only to the progress of its own industry and trade, but also to the expansion of the business of other cities. London is a great brokerage and office or administrative center for a vast amount of commerce handled through other cities. For example, the firms that import rubber and wool have their main offices in London, although the rubber and wool are handled mainly at other ports. Likewise, many freight forwarders operate from their London offices scores of vessels that seldom or ever visit that city. Three-fifths of the shipping of the entire world is British, and London is the chief center of the ownership and management of that vast tonnage. The business of marine insurance is so localized in London as to enable that city to control most of the marine insurance business of the entire world. The progress of other countries will naturally decrease Great Britain's and London's percentage of the total shipping and marine insurance; but there is no reason to think London's advance will suffer because of the development of business in other places.

As a banking center London must certainly lead the world for a long time to come, and the banking business of London may confidently be expected to increase, not only with the industrial advance of the United Kingdom, but also as the result of the economic progress of the world generally.

London's peculiar position in the retail trade of Great Britain will cause London to expand with the growth of the other cities of the United Kingdom. The retail shops in all cities outside of London carry comparatively small stocks, and much of the selling is from catalogues and by samples, the goods ordered by the buyer being secured by the merchant from London. This method of doing business has been made possible by the excellent organization of the package-freight traffic of the railroads. The railways of the United Kingdom serve a relatively small area, most of which is thickly populated, and they have been able to organize their freight service so as to handle traffic in small quantities and to deliver freight promptly. The railway company takes the packages of freight from the warehouse or factory of the shipper and delivers them to the shop or home of the consignee. Much of the freight business of British railways corresponds with the express service in the United States. Moreover, the British post office has an excellent parcels-post service for handling the small packages which the bookseller or small shopkeeper may desire shipped post-haste from London. Accordingly, London is and will remain the center of a retail trade that will require the labors of an ever-increasing number of people.

Furthermore, London is certain to become larger with the development of the United Kingdom and the progress of the British Empire, because it is the political and social center of that great realm. The functions of government tend to multiply, not to diminish, and the public service requires an ever-expanding army of employees. Moreover, the capital city of every great country is the favored residential city for that constantly enlarging class of fortunate people whose accumulated wealth permits them to retire from the pursuit of wealth to the more fascinating occupation of spending their time and money either in seeking personal happiness or in striving to make the world better. The rate of the growth of Washington, D. C., which is a strictly political and residential city, has been about the same as the rate of increase in the population of the United States. London is growing more rapidly than the United Kingdom, because may forces are influencing her progress.

A question we doubtless have asked ourselves many times is, Why is London an aggregation of several cities instead of being one unified municipality like Paris, Berlin or Philadelphia? This question has often come home to many of us with annoying force when we have wished to decide which 'bus or tram to take. Unless one has the cabman's or policeman's knowledge of the geography of the city—which, from unsuccessful attempts, I know, is not easily acquired—the only safe thing to do is either to hail a hansom, which is probably the wiser course of action, or to request a policeman to guide you to a 'bus or tram—which mode of conveyance is highly satisfactory, provided you succeed in boarding the right vehicle. Within the County of London, as you will recall, there are the cities of London and Westminster and twenty-eight boroughs, and outside of the county and still within Greater London there are 142 local authorities. The Greater London is a confederation of 172 places having varying degrees of local autonomy.

In order to answer a question in political geography such as this, one must needs revert, at least briefly, to history. Had London remained a Roman city, as it was for three and a half centuries, it would now have one common control, it would be a simple political unit. When the Saxons came to England they at first cared but little for the City of London. They preferred to live in small village communities; and as time went on many of these Saxon villages—Charing Cross, Westminster, Bloomsbury, Kensington, Hampstead, Hackney and a host of others—grew up about London. Thus, instead of the development of one large city in the heart of the area covered by modern London, there came to be one city of moderate size surrounded by numerous small towns. The Saxon institutions tended towards decentralization, and so did those of the Normans, who emphasized the importance of the *manors* that had been evolved from the village communities. The church organization also was built upon and strengthened the Saxon town and shire system. Stated briefly, the political development of the area now called London was that of a shire or county comprising many towns instead of one municipality.

English political institutions change slowly by evolution rather than by revolution. This tendency of the Englishman never to move until he is certain that his next step will be forward has slowly carried British rule around the world, and made the British flag the most potent of all the national ensigns; it has likewise resulted in honest and efficient national and local government. London is a decentralized confederation, because it has evolved slowly out of past conditions, but the people of the city now realize that the time for unification has come. Some not-far-distant day there will be only one mayor of London, and the officials of the entire Metropolitan District will join in the Lord Mayor's procession which will lead, not to the famous old Guildhall, but to a municipal palace occupied by the London County Council.

It has been said, "There are in London more Scotchmen than in Edinburgh, more Irish than in Dublin, more Jews than in Palestine, more Roman Catholics than in Rome." What motives and what forces have brought together the diverse peoples that compose this great aggregation of population?

Two words give the answer, liberty and opportunity. The Jews thronged into London before their temporary expulsion near the close of the thirteenth century; because greater religious tolerance and a better chance to gain a livelihood were to be found there than elsewhere; and since the removal of the ban against the Jews by Cromwell, they have settled in East London outside of Aldgate in increasing numbers for the same reason. Also the Huguenots when exiled from France found a cordial welcome in London, where they went in large numbers, taking with them their silk spinning and weaving industry. Until America and Australia became the great Meccas of the fortune-seeking emigrants from Europe, Great Britain was a land of promise that drew to its shores people from numerous Continental countries; and even now the immigration into the United Kingdom is of such volume as to have caused an agitation to be started for its regulation. The foreigners are drawn to Great Britain by the demand for labor by manufacturers, and the rapid industrial progress of London causes that city to receive the larger share of the inflowing current.

London's cab service is the delight of every tourist. Abroad the cabman is our trusted friend, at home he is our suspected foe. I have often been asked why it is that London has this complete, cheap and excellent service, and why we do not have it in American cities. We have all heard various answers to this question, but seldom the correct and simple one that London could not have a tramway system, such as we have in Philadelphia, even if it were desired—which is at least doubtful. Since 1850 American cities have depended almost entirely upon street railways for urban transportation; but the narrow, crooked, congested streets of the central area of Greater London were so ill adapted to horse cars and trolley lines that the people of London wisely decided to keep to their lumbering 'buses for slow movement, and to use their excellent cabs when greater speed or comfort were desired. Now the city has underground rapid transit; but so great is the volume of traffic that the tubes, the horse and motor 'buses and the myriad cabs are all required. The transportation system explains why the retail business is not centralized mainly within a few squares as in Philadelphia, New York and Chicago, but is widely distributed. The great size of London naturally would tend to a distribution of trade; but that is not the chief reason why the shops are scattered. The County of London, with its population of 5,000,000 people, is, as you are aware, smaller than Philadelphia. The explanation is to be found principally in the use of 'buses and cabs, instead of a system of street railways converging, as in Philadelphia, upon the central section of the city.

Such are a few, and only a few, of the questions that confront the tourist in London. One could not hope to answer all of them. Nor should it be inferred from what has been said to-night that a knowledge of economics and geography will alone enable one to understand and appreciate London. History, and literature, and art, and, most of all, open-mindedness are required.

London is more than a geographical product; the forces that have shaped its evolution have been both spiritual and material. It is a British city—its buildings, streets, social life and political institutions express the British mind. The genius of the city is unmistakably British. To know and appreciate London one must catch the spirit of the people who have created this great city and who now throng its maze of streets. This should be our first and last aim in visiting London, to catch mental step with the Englishman, to regard his city, his civilization, his culture as he views them.

If we succeed in realizing this aim, we shall become joint heirs with Englishmen in the noble heritage of British culture. London is the epitome of England; the summary and expression of a rich civilization. In closing, let me quote from Carlyle: "London City, with all its houses, palaces, steam engines, and huge immeasurable traffic and tumult. What is it but a Thought, but millions of thoughts made into one; a huge immeasurable Spirit of a Thought, embodied in brick, and iron, smoke, dust, palaces, parliaments, hackney coaches, Katherine Docks, and the rest of it."

The Oxford School of Geography.

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It was on a softly bright October afternoon in 1904 that the writer found his way from the Cornmarket through the narrow throat of "the Broad" in search of the Oxford School of Geography. Beyond the iron cross in the pavement which marks the spot where Latimer and Ridley were burned at the stake, the street widens into an amplitude which justifies its name. On the left are the imposing new front of Balliol, the old gateway and cottages of Trinity and a short row of gabled shops. In the near distance the lofty portico of the Clarendon building projects across the vista. On the right beyond another row of shops stands a complex group of buildings which form the geographical and academic heart of Oxford. The street front is guarded by a curved wall and iron railing and sentineled by a row of seventeen statutary *termini,* whereof the origin and design are lost in the mists of antiquity. Each column terminates in a colossal bust whose ample curling hair and beard are worthy of a classic philosopher, hero or god. Time and the weather have modified their original expression into various degrees of sternness, placidity or grotesqueness; but the most irreverent American student would hardly venture to offer any one of them the indignity of a coat of red paint. Through a doorway in the wall one enters between the severe plainness of the Sheldonian Theatre and the austere dignity of the Old Ashmolean Museum (1682). Beyond lie the sacred precincts of the Bodleian and the Divinity Schools. Thus housed in the midst of the ancient and venerable, on the upper floors of the Ashmolean, I found the newest and in some sense the most modern of Oxford institutions, the School of Geography, and astonished the genial curator by the announcement that I had come to stay all winter.

Specific instruction in geography at Oxford dates from 1887, when, by the initiative of the Royal Geographical Society, Mr. H. J. Mackinder, student of Christ Church, was appointed reader (equivalent to professor). In 1899, by the co-operation of the same society with the university, the School was established in its present quarters, and regulations were adopted for the granting of diplomas and certificates in geography to students who complete the prescribed courses of study. A geographical scholarship of the value of sixty pounds was also established, to be granted annually by competitive examination, open to members of the university who have taken "honours." The School is maintained by funds contributed equally by the Royal Geographical Society and the university and by students' fees.

The housing and equipment of the school leaves something to be desired in the way of space and of modern apartments and furniture. The contrast between the spacious and elegant quarters, well lighted, heated and ventilated, to be found at Pennsylvania, Columbia, Cornell or Chicago, and those at Oxford, hacked as well as hallowed by centuries of use, cannot help but be noticeable to an American. But here plain living is not incompatible with high thinking, and unornamental cases conceal treasures. There is a notable dearth of fine photographs and models so lavishly displayed upon the walls of an American geographical laboratory, but the collection of maps, in number, variety and quality, is ample. The school possesses (and uses) about 5,000 map sheets, many upon a large scale, the collection for Europe being substantially complete. These are made the chief reliance and instrument of laboratory instruction, and the possibilities of map expression and interpretation there demonstrated would be a revelation to most students and teachers of geography. There is the respectable nucleus of a geographical library, which is, of course, supplemented by the vast resources of the Bodleian, Clarendon and Radcliffe libraries near by.

Instruction consists of lectures and laboratory and field work. Mr. Mackinder held the readership until 1905, and during eighteen years lectured usually twice a week during term time upon historical geography. These courses were largely attended by students from the history schools, and in later years became so popular that it was necessary to give them in one of the halls of the Examination Schools. Since 1899 the greater part of the instruction has been given by Mr. Mackinder and by Mr. A. J. Herbertson (Universities of Edinburgh, Montpellier and Freiburg) as Lecturer in Regional Geography and Curator. The weekly program includes from eight to twelve lectures, three to five periods of laboratory instruction, a seminar and an all day field excursion on Friday, with which the weather seldom interferes. In 1905 Mr. Mackinder resigned the readership to devote himself to the duties of Director of the London School of Economics, and was succeeded by Mr. Herbertson.

The regular lectures for the year, three terms of eight weeks each, include, with some variations: The Historical Geography of Europe (16) and of the British Isles (8); the Regional Geography of Continental Europe (16), of America (16) of the Southern Continents (16), of Asia (8) and of the British Isles (8); the Comparative Morphology of Continents (24); Types of Land Forms (48); Illustrations of Geographical Method (8). In addition to this very substantial *menu*, other members of the teaching staff lecture or read with students upon various topics of ancient geography, the history of geography, and the climatic regions of the globe. Practical instruction is given also in surveying, mapping and military topography. The courses are planned to meet the wants of several classes of university students, rather than those of professional geographers. All but a small minority of students pursue one or more of the courses in geography as adjuncts to courses in ancient and modern history, education, military science and civil administration. In 1904-5 the whole number of different students was 325, of whom 276 men and 40 women belonged to the various colleges and halls. Thus relations of the most intimate character are maintained between the School of Geography and the University. At the same time the school furnishes extended and substantial opportunities to special students who are not members of the University.

The term attendance varies from 110 to 150 students, most of whom simply attend lectures, without taking part in practical exercises or examinations. Six persons have held the scholarship. Diplomas have been awarded to ten and certificates to eight candidates. Each candidate for the diploma must pursue a course of instruction in the school for at least one academic year and pass an examination in three of the following subjects, of which regional geography must be one: (1) Regional Geography, (2) Climatology and Oceanography (3), Geomorphology, (4) Ancient Historical Geography, (5) Modern Historical Geography, (6) History of Geography, (7) Surveying.

Regional geography is made the nucleus and nexus of instruction. It is held to include "the chief generalizations regarding the surface forms of the land, the movements of air and water, the distribution of plant associations, animals and man, and the chief facts of modern political and economic geography considered in relation to the influence of physical features," and on the formal side the principles and practice of map making and map interpretation.

In climatology special attention is given to methods of meteorological and oceanic research, to the tabulation and plotting of data, and to the division of the earth into climatic provinces.

In geomorphology, the characteristics, development, distribution and classification of land forms, according to the doctrines of modern European and American geographers, are uncompromisingly taught. Geology is constantly assumed as a basis, to the details of which possibly an exaggerated importance is sometimes given.

In historical geography the economic, strategic and political conditions of ancient Greece and Italy and of medieval and modern states, especially those of Europe, in relation to the influence of physical features, are emphasized. The history of geography includes the development of geographical ideas and methods, as well as the progress of discovery.

Surveying comprises cartography, triangulation, leveling, hypsometry, contouring, magnetic surveying and the general principles of geodesy, and involves familiarity with the use of all the important instruments employed in such work.

A few typical specimens of the questions set at the examinations for the diploma will indicate the high grade of attainment required and the doctrines held by the school as to the nature and scope of geographical science:

"Give a simple classification of mountains according to the mode of their origin, and indicate a more exhaustive method of treating this question.

"Compare the influence of environment on the distribution and development of plants, of the lower animals, and of man.

"Describe the configuration and drainage of the Indian Empire, and correlate with them the distribution of the human races, so far as indicated by the main lines of linguistic difference.

"Give an account of the submerged plateau upon which Britain stands. What effect has it upon the character of the British tides?

"Discuss the cycle of geographical change in a volcanic area.

"Illustrate from the geography of South Africa the effects of geological structure upon scenery.

"Illustrate the effect of folding and faulting of strata upon the surface features in any district of North America west of the Mississippi.

"Discuss the statement that, for most historical purposes, the true southern boundary of Europe is the Sahara, rather than the Mediterranean.

"Correlate the chief facts of the struggle between the British and the French in North America with the physical features of the continent.

"Name the chief exponents of geographical theory from Ptolemy to Ritter, stating in the case of each the most important truths or opinions with which he is identified.

"Give a short description of the general characters of (*a*) the deep sea fauna, (*b*) the fauna of the Aralo-Caspian lakes, (*c*) the fauna of oceanic islands, (*d*) the high Alpine flora.

"Analyze the position of London.

"From a geographical point of view discuss the results which might be expected to follow from the possession of Tibet (*a*) by Russia, (*b*) by Britain.

"Explain by reference to the upland scenery of different regions the influence of climatic conditions upon earth sculpture.

"Give a brief epitome of the views of Suess with regard to the nature of crust movements.

"Give a brief account of the influence of American workers upon the study of geomorphology.

"Discuss the site of Rome (*a*) as an administrative center for Italy, (*b*) as a base for sea power in the Mediterranean.

"What modifications in the geographical cycle are produced by glaciation? Illustrate from the surface geography of North America.

"Analyze the position of Vienna as a medieval and modern metropolis, and compare it with that of Paris.

"Draw a sketch map showing the more important portages from the Great Lakes to the Mississippi, and show the connection of any of them with historical events.

"Compare the hinderlands of the ports of New Orleans, Galveston, Baltimore, New York and Montreal.

"Trace the evolution of the Great Lake system of North America."

The geography of the Oxford School stands firmly upon a physical basis, has for its primary theme the distribution of forms and phenomena, "natural" and human, and from this standpoint takes an absolutely unlimited view of the complex interaction of physical, vital and psychic forces and factors over the whole face of the earth, and extending in time as far back, at least, as the beginning of the Quaternary period. The lectures given there seem based upon an almost encyclopedic knowledge of geographical facts, and abound in wide and brilliant generalization. At the same time the validity and force of scientific evidence, as well as the caution required in reaching scientific conclusions, are duly insisted upon. The teaching follows a happy mean between dogmatism and timidity. The writer has nowhere met with a better or more persistent demonstration of the scientific spirit and method. The ideal seems to be nothing less than the demonstration of "the magnificent accord between the earth and all that germinates and develops upon its surface."

The student of geography who wishes to broaden his outlook and sharpen his ideas by European study would do well to spend a term or more in the atmosphere of the Oxford School, which blends so harmoniously the old and the new. Not the least memorable of his experiences will be the cycling excursions over the cuestas, scarps and downs and through the consequent, subsequent, obsequent and beheaded valleys of the upper Thames basin.

A Regional and Economic Geography of Pennsylvania.

PART II.

Political Geography.

WALTER S. TOWER.
Instructor in Geography, University of Pennsylvania.

Pennsylvania occupies a unique position among the states of the Union. It is the only state which borders on the Atlantic—through the Delaware estuary, the Great Lakes system, and the navigable waters of the Ohio-Mississippi Rivers. For this reason, if for no other, the name of the "Keystone State" is fitting. Pennsylvania is also the only state which contains within its limits important areas of all three of the topographic divisions of the Appalachian region—the low Atlantic slope, the central belt of ridges and valleys, and the western plateau. Because of this location and varied topography, coupled with diverse natural resources, the state presents many interesting responses to the surface conditions, as in boundaries, especially of the counties, distribution of population and location and growth of cities and towns.

Boundaries and Extent.

Pennsylvania is the fifth in size among the Atlantic states, being exceeded by Georgia, Florida, North Carolina and New York. Its area is 45,215 square miles, larger than all New England, excepting Maine, with the addition of New Jersey and Delaware. In shape it is very nearly a rectangle, with an irregular eastern edge marked by the course of the Delaware River. The state ranks second only to New York in population and wealth, and has more cities of over 25,000 inhabitants than any other state except Massachusetts. The boundaries separating Pennsylvania from New York, Ohio, West Virginia, Maryland and Delaware are artificial limits. The Delaware River, separating the state from New Jersey and New York on the east, and the short stretch of lake front on the northwest, are the only natural geographic boundaries. The way in which these limits came to be what they are has been of the utmost significance to the development of the state.

By the terms of the royal charter "Penn's province" was to be bounded on the south by the circumference of a circle whose center was New Castle, in the present State of Delaware, and whose radius was twelve miles long. The circle was to be drawn from north to west until it reached the "beginning of the fortieth degree" of latitude, which was construed as meaning the thirty-ninth parallel. From this point of contact the boundary was to extend due west for a distance equal to five degrees of longitude. The northern boundary was to be the beginning of the forty-third degree, which was accepted as meaning the forty-second parallel of latitude.

On both north and south there were disputes over the territory. The Baltimores, on the south, had been granted, as part of their proprietary province, the land whose northern boundary extended west from that part of Delaware Bay "which lieth under the fortieth degree of latitude." And they construed this grant to mean the land between the thirty-ninth and fortieth parallels. Thus a strip one degree wide was in dispute.

It was finally discovered, after much wrangling, that the circle drawn about New Castle as a center would not touch the fortieth parallel, which lies about forty miles to the north. An agreement was finally reached in 1763 to accept 39° 44′ as the limit, and this line became famous as Mason and Dixon's line. But at the time the original survey was made the line was not run the whole extent of five degrees westward because of the interference of the Indians. Virginia, as a result, persisted in her claim to the area in the present southwest corner of the state, up to the fortieth parallel, including the site of Pittsburg. The claim was largely the result of the recognized importance of the junction of the Allegheny and Monongahela

Rivers, commanding the three valleys, to the north, south and west. The possession of this junction would give important advantages to the holder. But in 1779 the line was run its full length on the south, and the western boundary was extended north to the lake.

On the north, Connecticut claimed the strip of territory between the forty-first and forty-second parallels, by virtue of its charter grant of the "area to the west." All through the first half of the eighteenth century the disputed possession of this region was the cause of actual warfare and bloodshed. The particular cause of strife was the beautiful Wyoming Valley, then rich farming country—now the great coal region of Lackawanna and Luzerne Counties. The long-continued struggle between the persistent New England settlers and the followers of Penn was finally settled peaceably in 1782. The forty-second parallel was agreed upon as the northern boundary.

This boundary, however, gave Pennsylvania only four miles of water front on Lake Erie. Pennsylvania was still dissatisfied: it wanted the good harbor behind Presque Isle. And in 1792, after New York and Massachusetts had agreed to cede the "Erie triangle" to the federal government, Pennsylvania bought it for about $150,000. Thereby the state was established as it stands to-day. The importance of these different decisions is far reaching. Between the two rival claims on the north and the south the undisputed territory was limited to a narrow strip of country about seventy miles wide—a strip containing neither Philadelphia nor Pittsburg and with little that has gone to make Pennsylvania the mighty state which it is.

Boundaries of Counties.

The state is divided naturally into three distinct topographic divisions, each of which has given different political and economic conditions. These divisions, as will be remembered, are: the eastern province, or the Atlantic slope; the central province, or the ridge and valley belt; and the western, or plateau province.

The system of dividing states into counties was originally a reflection of the English custom, where it had been adopted to facilitate the administrative functions of the government. At first, when Pennsylvania was thinly settled, the counties were large—to include as many people as ready communication would allow to be grouped together for the administering of justice, collection of taxes, and so on. In later years the steady growth of population resulted in the development of new political units, and the larger counties were subdivided to form new ones.

The outlines of the counties, as seen on any good political map, present a striking contrast. In the southeast the county lines are irregular; in the central portion they show a marked curving sweep toward the northeast; and in the northern and northwestern portions there is a distinct rectangular character. The cause of these differences is at once clear if the topography of the districts is recalled. In the open country in the southeast corner of the state there were no natural boundaries except the Delaware, Schuylkill and Susquehanna Rivers and Kittatinny Mountain. Between these limits the division into counties was largely casual. The almost unbroken mountain barrier on the northwest, however, acts as the dividing line between the southeast and the central counties, with but two exceptions. Lebanon and Dauphin Counties extend over the ridge, but it might be expected that they would. In Lebanon County the gaps made by Swatara Creek open up the valley beyond. And Dauphin County contains the great gap of the Susquehanna River, making an easy entry all along the western border of the county. In other words, Kittatinny Mountain has acted as a barrier to ready communication, and the political units have conformed to its control.

The ridge enclosed valleys of the central province from geographic units and they have been made into political units. Perry, Juniata, Mifflin and Fulton Counties are the best examples. The distinct sweep of the lines in a curve toward the northeast only reflects the same trend of the ridges which these boundaries follow. As in the case of Kittatinny Mountain, the crest of the Allegheny escarpment, forms the northwest limit of the central counties, in that portion of its extent where it is a well marked wall—that is, as far north as Blair County. Further north, where the escarpment is broken by the gorges of the Susquehanna's tributaries, communication across the front is easy, and there the counties lap over into the plateau country. The western limits of Centre, Clinton and Lycoming Counties illustrate this point most clearly.

In the western hilly country there are, for the most part, no very distinct natural geographic units. The region was arbitrarily divided into counties by an act of the Legislature in 1800. In that sort of topography rectangular boundaries, run by compass direction, were most feasible, in the absence of well developed political units. A natural boundary has been followed in one or two cases, as the crest of Laurel Hill, between Somerset on the east and Fayette and Westmoreland on the west, while these latter two are separated from Greene and Washington Counties by the Monongahela River. The Conemaugh River marks the southern limits of Indiana and Armstrong counties, and parts of the boundaries of Clarion County follow the Allegheny and Clarion Rivers. Elsewhere throughout the region the county lines are arbitrarily located, because the political units tend to center *around* the valleys instead of being limited by them.

Distribution of Population.

Pennsylvania ranks fifth in size among the Atlantic states and sixth in density of population, for which the census of 1900 gives 140.1 persons per square mile. In density of population the state is exceeded by Rhode Island, Massachusetts, New Jersey, Connecticut and New York. It is significant of the development of the state that, with the single exception of New York, the states which rank ahead of Pennsylvania in size, fall far below the number of people per unit of area. North Carolina is nearest with 39. and Florida last with 9.7 persons per square mile.

The population, however, is not uniformly scattered over the entire state, but ranges from a density of 14 per square mile in Pike County to 10,000 per square mile in Philadelphia County. In this varied distribution marked geographic and economic influences may be traced. For example, the dense population of Philadelphia County is due to the growth of the great seaport, commercial and industrial center on the navigable Delaware. Nearby counties, as Delaware and Montgomery, have 531 and 277 persons per square mile, directly due to proximity to the city. Allegheny County, with a density of 1,022 shows the importance of the location of Pittsburg and Allegheny City, at the head of the Ohio River and in the heart of the soft coal region. Similarly the great industries of Allentown, Bethlehem and Easton give high population figures in Lehigh and Northampton Counties, where these cities are located—a region which would otherwise be almost purely an agricultural community like Franklin and Cumberland Counties, in the southern part of the state, where the surface conditions are very closely analogous. The difference lies in the nearness of the former counties to the coal fields, with easy railroad and cheap canal transportation down the Lehigh Valley. Finally, Lackawanna, Luzerne and Schuylkill Counties, have 412, 282 and 220 persons per square mile—a population grown up entirely around the anthracite coal industry and the manufactures it has attracted.

On the other hand, Chester County, a farming and dairying district, adjoins Delaware and Montgomery Counties, but in population per square mile, it has less than one-fourth that of the former and less than one-half that of the latter. Washington and Butler Counties, adjoining Allegheny on the north and the south, respectively, have a population less than one-tenth as dense. And finally Wyoming, Wayne and Monroe Counties, rugged and not especially fertile, are all contiguous to Lackawanna and Luzerne, and all have less than fifty inhabitants per square mile. In every case the sharp contrast between adjacent regions is the direct result of the character of the region and its resources.

As examples of the way in which the development of natural resources affects population the changes in Clarion and Jefferson Counties are illustrative. During the period from 1835 to 1850 numerous charcoal iron furnaces were located in what was then known as Venango County because of the abundance of wood for charcoal. The population grew so fast from this cause that in 1839 Clarion County was set off by itself. After 1850 the gradual introduction of coal in the blast furnace caused the charcoal iron industry to die out entirely, because Clarion County is not a coal region and it was cheaper to build furnaces where fuel did not have to be transported. Consequently there was an exodus of the iron-making population. This exodus, however, was just about counterbalanced by an influx of lumbermen, so that the statistics of population do not show any great change. Soon after 1870, with the practical exhaustion of the forest, the lumber business was waning, but the discovery of oil in the region caused another great influx of speculators, merchants, drillers, and so on, which reached its maximum in 1877. Since that year there has been a steady decrease accompanying the gradual exhaustion of the best oil fields. This change of population is evident at once in the census figures for the different decades.

POPULATION OF CLARION COUNTY.

1850, 23,565; 1860, 24,988; 1870, 26,537; 1880, 40,328; 1890, 36,802; 1900, 34,283.

Jefferson County, adjoining Clarion on the east, had a total population of 161 persons in 1810, and settlements were made slowly until the lumber boom subsequent to 1830. In the decade from 1830 to 1840 the population was more than tripled, increasing from 2,025 to 7,253. This sudden increase was followed by a steady but less rapid growth until 1870, when the building of a branch railroad along the Red Bank River opened up the coal fields near Reynoldsville. Another boom then set in, so that between 1870 and 1890 the population was more than doubled, accompanying a rise of the county from a rank as a backwoods region to hold seventh place among the bituminous coal producing counties in the state.

In the anthracite region the same conditions may be observed, where the population has kept pace with the growth of the coal mining industry since 1820. The case of Schuylkill County is particularly striking in the period from 1820 to 1830, when the building of canals opened up the field. In 1820 the population was 11,311, and in 1830 it was 20,748, almost doubled. Again, in the decade from 1840 to 1850, the building of railroads gave a new impetus to coal mining and the population more than doubled, increasing from 29,000 to over 60,000. And all of this rapid growth was in a region so unfavorable in every way that, except for the existence of the coal beds, it would not have supported anything more than the sparsest farming population.

By way of contrast, the population in the central counties of the state has been steadily falling off in the last few years. Juniata, Fulton, Huntingdon, Perry, Snyder, Centre and Union Counties all show a decreasing population, ranging from a loss of 200 to $2,000, extending over ten or twenty years. A number of these counties were once the possessors of important iron industries, depending on the local "pot deposits" or iron ore. They have always been largely agricultural districts, however, and one of the main causes of the decline is to be found in the general decline of eastern agriculture, particularly in cereal crops. The shut-in, isolated character of the individual valleys, with poor transportation facilities, is the other great underlying factor.

The effect of the open country in the southeast province is manifest in the much greater density of the scattered or rural population. The larger number of cities and towns in comparison with the total area of the province reflects the same advantage of open communication associated with proximity to the seaboard, with the consequent industrial and commercial advantages. Fourteen out of the fifteen large cities in the central province are grouped around the coal and iron industries in the four counties, Lackawanna, Luzerne, Northumberland and Schuylkill, covering about one-fifth the area of the province. And nine of the eighteen cities in the plateau region are in Allegheny and Westmoreland Counties, grouped around the Pittsburg area. On the other hand, the lack of important natural resources, the purely agricultural character of the region, and the difficulties of communication because of long unbroken mountain ridges, readily explain the scattered population over the most of the central provinces, where, outside of the coal producing counties, there is only one important city, the railroad center at Altoona.

Regarding each main topographic district as a whole certain characteristic conditions are to be found. Leaving out the populations of all the larger cities and towns—those having 10,000 inhabitants and over—the three provinces show the following figures according to the census of 1900:

Distribution of Population.

DISTRIBUTION OF POPULATION	TOTAL POPULATION	URBAN POPULATION	NO. OF CITIES 10,000 AND OVER	RURAL POPULATION	AREA SQUARE MILES	DENSITY OF POPULATION
Southeast Province	2,601,200	1,607,175	15	998,064	8,154	112
Central Province	1,216,397	327,298	15	889,099	12,728	69
Plateau Province	2,456,611	762,972	18	1,653,638	24,333	67

Location of Cities and Towns.

The location and growth of cities and towns as a response to geographic and economic conditions has been suggested already. In the number of cities of 25,000 inhabitants or over Pennsylvania ranks second, with 18. Massachusetts has 20 and New York, ranking third, has only 12.

Rank of Large Cities in Order of Size.

Over 100,000.	*50,000-100,000.*	*25,000-50,000.*	
Philadelphia.	Reading.	Lancaster.	Chester.
Pittsburg.	Erie.	Altoona.	York.
Allegheny.	Wilkesbarre.	Johnstown.	Williamsport.
Scranton.	Harrisburg.	Allentown.	Newcastle.
		McKeesport.	Easton.

With three exceptions, Lancaster, York and Newcastle, these cities have been built up on navigable waters, or were touched by the system of canals which spread over the state in the first half of the last century. In all these cities, however, the locations most interesting are those of the three "corner" cities—Philadelphia on the Delaware; Pittsburg, with Allegheny, as a river port in the southwest, and Erie, the lake port, in the northwest. The importance of Philadelphia must inevitably grow with the completion of a new, deeper ship channel in the Delaware. Erie is particularly favored in having a harbor protected on all sides. The improvement of the Erie Canal to Buffalo, meaning more lake traffic, means that a greater share may fall to Erie, and still more so with the completion of a proposed canal from Pittsburg to the lake. Pittsburg already benefits greatly from slack-water navigation in the Ohio and Monongahela Rivers, and has a water traffic almost equal in tonnage to that of the Suez Canal. Pittsburg has coal enough for ages to come; natural gas favors the glass industry; and progressive improvement of navigation on the Ohio will still further stimulate the growth of the city.

On the other hand, the great cities which have grown up in the anthracite coal region are on a somewhat insecure footing. These cities depend on the coal mining and its allied industries, or on industries which have located near an abundant supply of fuel and labor. At the present rate of production the anthracite coal industry will have exhausted the supply before the end of the century. The prime factor in the early growth and support of these cities will then be removed. Power must come from fuel brought in or else from harnessing such rivers as the Susquehanna, Lehigh and Schuylkill to furnish electric power. What will be the future of these cities remains a matter of conjecture, but it is not as bright as for other places in the state.

The Pennsylvania cities as a class represent different influences from the large cities of Massachusetts and New York State. In Massachusetts most of the cities have grown up where there has been the advantage of harbor facilities or of water power—sometimes of both. The New York cities are chiefly strung out along the great natural highway of the Hudson and Mohawk Valleys, followed by the Erie Canal and later by the railroads. Pennsylvania cities, however, make three groups, in the southeast, the southwest and the northeast—in both the latter groups the main cause for city development being found in the existence of great natural wealth in the form of coal.

Many of the smaller towns show geeographic influences in their location. In the western counties, especially along the Monongahela, Allegheny and Ohio Rivers, there are a large number of small towns built up on terraces in the river valleys. New Brighton, Beaver Falls, Newcastle, Monaca, Sewickley and Titusville are of this type. The controlling factors there have been that the river terraces offer the best level sites for towns, the valleys are the main routes of travel, and the important coal mines are located along the valley sides. Another class of towns has grown up about natural springs, as Bedford Springs, in Bedford County; Cambridge Springs, in Crawford County, and Bellefonte, in Centre County. And finally there are the towns located opposite the gaps in the ridge mountains of the central province. Pottsville, Mauch Chunk, Shamokin and Mt. Carmel, in the coal fields, and Mifflintown, Lewistown and Huntingdon, in the Juniata region, all belong to this class, having grown up at these natural gateways where roads and railroads must converge.

Character of the Population and Social Conditions.

The discussion of geographic influences in the history of the state would readily make a good sized volume, but there are certain general conditions of development and present status which should be noted. Pennsylvania has been, almost from the very first, populated by many nationalities. The Swedes, Dutch, Quakers, Germans, Scotch-Irish, Welsh and Slavs have been the chief elements. Each race brought its own ways and standards of living; each was more or less inclined to keep its own customs and usages unmodified—the Dutch, Germans and Slavs most of all. Coupled with this condition, the fact that the races have tended to localize themselves has been a great hindrance to making the people of the state into a political unit. Enlightened legislation, such as compulsory education and restriction of labor of children, has been hard to pass and still harder to enforce, very largely as a result of this lack of political unity and marked diversity of interests.

The Quakers and Germans were conservative elements. The Scotch-Irish were radical, vigorous, fighters; they were pioneers and could not live in peace with the other people as neighbors. Hence they were constantly found on the frontier. The Scotch-Irish made the Whisky Rebellion. The farmer in Eastern Pennsylvania could send his corn very easily to the seaboard markets and get a good price for it. The Scotch-Irish pioneer in the western part of the state could not transport his bulky corn over the mountains. But he wanted the profits from the good market in the east. A good deal of corn could be made into a small bulk of whisky. This whisky could be readily carried on horseback over the rough mountain trails and sold for three or four times as much as the value of the original corn. The Scotch-Irish farmer did not see why his trade in whisky should be regulated, because it was the best source of income for him. In other words, the rebellion was a question of isolation and transportation of products.

The Whisky Rebellion brought up the first suggestion ot an eastern and a western Pennsylvania, with the line of separation represented by the escarpment of the Allegheny plateau. The two parts of the state have widely diverse interests. In the east commercial interests and agriculture are paramount; in the west, mining and its allied industries reign supreme. So completely unlike are the interests of these two great regions that there has actually been discussion of dividing the state by a north-south line. It is not at all uncommon, moreover, to hear some one style himself as a "Western Pennsylvanian"—not infrequently with a tone which pays little compliment to the rest of the state. Such a condition can be explained readily on the basis of geographical conditions which favor separation and diverse development.

The Pennsylvania "Dutch" still have villages where the customs and ways of dress and living have altered but little from those of the mother country. Such places are chiefly in the rich farming lands of the southeastern district, for the German is a successful farmer.

The Slav population, however, is the most distinctly and widely separated from all others. The Slavs are the coal miners, chiefly in the anthracite region, and there the physical conditions are unusually favorable for isolation and the preservation of original standards of life. The Slavs are good miners, but they have an entirely different attitude toward marriage, religion, education and social conditions in general, from that held in the state at large. The Slav is the most recent admixture in the population, and the Slav community presents an important political problem.

ACTIVITIES OF THE SOCIETY.

PRESIDENT'S STATEMENT OF THE PROGRESS OF THE SOCIETY AT THE STATED MEETING, NOV. 6, 1906.

The progress of our Society during the past twelve months has been most gratifying. The best evidence of this is the increase of its activities. At the November meeting last year President Bryant expressed regret regarding the irregular and infrequent appearance of the BULLETIN, and stated that plans were being made to have the publication appear more regularly. At the beginning of this calendar year the BULLETIN became a quarterly journal. Four-fifths of the papers published have been by members of the Society, and the high standard of excellence maintained in these papers is proof that we are a working body. Your Publication Committee is planning to make the BULLETIN larger and better the coming year than it has been the past year. The policy of the Committee, however, will be to have the journal continue to be mainly the bulletin of this Society.

The use of the Library by all the members of the Society is earnestly recommended. The Library Commitee bespeaks your co-operation in its work of increasing the collection, and would be pleased to have you contribute such geographical volumes as you may be willing to donate. Gifts of money for the purchase of books will be most gratefully accepted.

The intermonthly meetings of our Society are of, by and for the members. They and the BULLETIN are the means whereby the Society as a whole may enjoy the results of the work done by the individual members. As it is difficult, if not impossible, for the President and Board of Directors to have personal knowledge of the work being done by all of the 750 members, it is hoped that members will feel free to inform the Chairman of the Publication Committee, or the President, of the trips they have taken during the past summer, of the studies they have made, and of the work they are doing.

The increase in membership, especially during the past six months, shows that our Society is becoming of increasing service. Since the first day of May the membership has increased from 690 to 728.* The Society should welcome and work for a continuation of the present rate of increase. We ought to have at least 1,000 local members, and as many more than 1,000 as we can be of service to. The Board of Directors hopes that our BULLETIN will gradually increase the roll of non-resident members. Eventually the extra-mural membership ought to exceed greatly the number of members resident in Philadelphia. Besides availing yourselves of the privileges afforded by the BULLETIN, the Library and the meetings, there are two other ways in which you may greatly promote the interests of your Society:

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* There were sixty resident and non-resident members elected to membership in November and December.

One very practical way for you to aid the Society is to change your membership from the annual to the life basis. As you know, all life-membership dues are invested and become a part of the permanent endowment. Those who send the Treasurer $100 will be freed from the annoyance of the annual bill for dues, and will have the satisfaction of feeling that their membership will be a help to the Society as long as it exists.

You can further be of service to the Society by bringing to the attention of the Board of Directors the names of your friends and acquaintances whom you know to be interested in the work being done by the Society. Our Society is a social as well as a scientific organization, and our policy in the future may well be, as it has been in the past, to enlarge our local membership by making our friends members. This policy, however, can hardly place any limitation upon our growth; for doubtless each of us has a large number of acquaintances still without the pale of our membership.

THE AMUR RIVER AND THE ISLAND OF SAKHALIN

ADDRESS BY

MR. CHARLES H. HAWES

At the Stated Meeting, December 5, 1906.

Mr. Hawes gave a very entertaining and instructive account of his travel through the Amur region and on the island of Sakhalin, districts about which but little was known up to five years ago. Perhaps the most interest centered about the graphic descriptions of the conditions of life on the island of Sakhalin, and especially in regard to the penal settlements. In speaking of these prisons, Mr. Hawes said:

"Until the recent Russo-Japanese war, the Siberian island of Sakhalin had remained a *terra incognita*. It was, therefore, not surprising that in 1901 I should have been the first English traveler to explore the northern interior, and to record the customs and ceremonies of the Sakhalin Gilyaks and Orochons. My seven weeks' residence on the island gave me also the opportunity of observing the worst Siberian penal settlements.

"The condition of these was appalling. Alexandrovsk, the 'capital,' is 6,752 miles from St. Petersburg and simply an abode of criminals; yet in this terrible environment there was one sign of culture, marking the presence of political exiles, a small Ethnological and Natural History Museum (since, I am sorry to say, burned down by the Russians during the Japanese attack). Of its 6,000 inhabitants, excluding the officials, the convicts' wives and children, not more than a dozen were free-born individuals.

"The whole island contained about 22,000 convicts and ex-convicts, of whom not less than 8,000 were murderers. Escape from Sakhalin is nearly impossible, but flight into the interior is of quite common occurrence; hence the forests are infested with 'Brodyagi' (outlaws) who, as I was informed before I landed, will murder for the sake of '20 kopyeks (ten cents) or a pair of boots.'

"On my arrival I was arrested, but set at liberty after a short detention, though, like the majority of prisoners, I remained under official surveillance. To the relief of the authorities I decided to penetrate the interior, leaving the Russian settlements behind.

"This journey of 700 miles was accomplished mainly in a 'dug-out,' camping on river edge in the primæval forest or sleeping in the greasy, smoky huts of the natives, who gave me a warm welcome, and shared with me their food of sun-dried fish and their coverings of reindeer—and fish-skin. They are primitive peoples, ignorant of agriculture, and without a written language, yet possessing a folk-lore rich in songs, legends and stories which present much of interest and value to the anthropologist.

"The great bear fête, a sort of Thanksgiving Day, at which bruin is sacrificed with semi-totemistic rites, takes place in January of each year. Shamanism, the practice of witchcraft and exorcism, is losing its hold upon the tribes, but the Gilyahs still possess a great 'Cham' or 'Medicine Man,' who is reputed to be a powerful exorciser of evil spirits and a foreteller of future events.

"The capture of the island last year by the Japanese was conducted with extraordinary skill and rapidity, largely owing to the use of cavalry; and the treaty of Portsmouth has given back to them that portion to which they had substantial claims and which was of primary importance to them as a fishing ground."

A large number of excellent illustrations added to the interest in Mr. Hawes' narrative concerning this almost undiscovered country.

THE FIELD WORK OF THE PEARY ARCTIC CLUB

ADDRESS BY

COMMANDER ROBERT E. PEARY.

The meeting of the Society December 21, 1906, was one of the largest and most enthusiastic meetings ever held. Commander Peary's recital of his recent attempt to reach the North Pole was a thrilling narrative of heroic endeavor. The lecturer spoke in part as follows:

"Ladies and Gentlemen, Fellow-Members of the Philadelphia Geographical Society: I assure you it affords me great pleasure to be present with you again after an absence of nearly two years. There could be no more fitting day for the meeting of a Geographical Society, and the consideration of an Arctic topic, than this 21st of December, the winter

solstice, one of the world's great days, beside which all our artificial dates and holidays sink into insignificance. Particularly is this a vital day for the Arctic regions, because to-night the sun turns northward once more. A year ago to-night I called my Eskimos together, after a special banquet on their part, and said to them: 'Innuksue tessingwah sukkinuksoah tigiarcto' (My Eskimos, the great sun is now turning back to us.) It was not the first time I had told my people this in previous years, but the glad cries with which they welcomed the information showed that it would always be a great occasion for them.

"The past eighteen months has very appreciably widened our horizon in the western half of the central Polar Sea. The fact that the Stars and Stripes have been again placed in the lead in that centuries-long test of persistence, endurance and experience known as the 'international race for the Pole,' possesses naturally the greatest popular interest. But there have been other results. New lands have been traversed and delineated, conditions in the western half of the Arctic Ocean found to be distinctly different from preconceived theories, and additional observations made in the realms of meteorology and hydrography.

"These results are due entirely to the generosity of the members of the Peary Arctic Club, of New York City, and especially to the unfailing interest and personal efforts of its President, Morris K. Jesup."

The narrative of the trip of the ship "Roosevelt" northward through Baffin Bay, Kane's Basin, Kennedy and Robeson Channels to Cape Sheridan, Grant Land, where the "Roosevelt" was obliged to go into winter quarters, was briefly given, excellently illustrated with appropriate slides. Winter quarters were established on Grant Land, near Cape Sheridan, and hunting parties spent much of the winter securing reindeer, hares and musk oxen, which animals provided the food supply for the winter and proved of great assistance to the expedition. In February the attempt on the Pole was made over the mainland some distance northwest of Cape Sheridan. As the parties with the sledges and dogs proceeded across the ice pack they met with numerous delays, due to the open stretches of water. The Polar ice pack was broken up more than it usually is because of the warm southern winds that had prevailed frequently during the previous winter. One very severe gale of six days' duration separated Commander Peary from his supporting parties and compelled him to proceed on his march towards the Pole without the assistance of the parties upon whom he had counted for supplies. After advancing as far north as it was considered possible to go and yet to return, Commander Peary found that his latitude was 87° 6" north, a point nearer the Pole than had been obtained by any previous expedition. The dangerous trip back across the ice pack was safely accomplished, the party reaching the coast of Greenland on its return. Shortly before reaching land Commander Peary's party crossed the trail of the Clarke party, thus fortunately saving the lives of Clarke and his companions. After reaching the "Roosevelt," exploring expeditions went along the coast as far as Cape Columbia, thus completing the exploration of the northern side of Grant Land.

Commander Peary concluded his address by stating that "assertions that the Pole cannot be reached; that the result of the last expedition has been to show the unavailability of dogs and sledges and of the route followed; that there are better methods for attaining the Pole than by dogs and sledges and that the discovery of the Pole is not a matter of any value or interest are equally erroneous.

"The result of the last expedition of the Peary Arctic Club has been to simplify the attainment of the Pole fifty per cent; to accentuate the fact that man and the Eskimo dog are the only two mechanisms capable of meeting all the varying contingencies of Arctic work, and that the American route to the Pole and the methods and equipment which have been brought to a high state of perfection are the best for attaining that object.

"Had the past winter been a normal season in the Arctic regions and not, as it was, a particularly open one throughout the northern hemisphere, I should have won the prize.

"And even if I had known before leaving the land what actual conditions were to the northward, as I know now, I could have so modified my route and my disposition of sledges that I could have reached the Pole in spite of the open season.

"Another expedition following in my steps and profiting by my experience cannot only attain the Pole, but can secure the other remaining principal desiderata in the Arctic regions, namely, a line of deep sea soundings through the central Polar Ocean, and the delineation of the unknown gap in the northeast coast line of Greenland from Cape Morris Jesup to Cape Bismarck. And this work can be done in a single season."

Book Notes and Reviews.

Allen, Grant. *Florence.* Newly revised and enlarged edition. By J. W. and A. M. Cruickshank. A. O. Wessels Company, New York. 1906.

Every one who has waded through the infinity of guide books on Florence naturally has his favorite. For primary basic housekeeping information —such as hotels, cabs and fares, omnibuses, tramways, etc.—Baedeker is indispensable. Those questions once settled, the voyager wants something that breathes more of the Etruscan atmosphere and is a part of the Renaissance itself. Just here is where diversity of opinion will be greatest among those who know and love their Florence, and yet we believe that among all the votaries of precious Firenze none but words of kindest appreciation can be found for this particular volume from Grant Allen's pen. If ever one wrote out of the fullness of his heart and his knowledge of things he loved almost as his own soul, it has been done here—and one almost feels that the writer is just at his elbow as he says, "See this by morning light. Choose a bright morning. Take your opera glasses." Again, "Pursue the subject farther at your leisure if it attracts you." Of course, this is what one would do anyhow, but this is what lends a personal note to a little pocket volume of 300 pages that will help any one who wishes to get "born again" in Florence.

Wendell Reber.

Archer, Francis Bisset. *The Gambia Colony and Protectorate.* Pp. 364. St. Bride's Press, Ltd., London.

In this comprehensive work Mr. Archer has framed not only the official handbook, but also a most interesting account of the growth and status of a British colony on the Guinea coast of Africa which, perhaps by reason of the capable Anglo-Saxon administration and the absence of encroaching neighbors, has to most Americans remained unfamiliar. The development of the colony is set forth succinctly from its mediaeval occupation by private individual and trader, sometimes separate persons, often the same, to its first recognition, by the treaty of 1783 as British territory and its subsequent denomination in 1888 as a crown colony.

For many years secretary of the colony, the author has had ample opportunity to collect and tabulate an immense fund of information of wide extent ranging from an official directory and postal guide of the colony, through detailed hospital regulations and suggestions to prospective travelers, to a vocabulary of the language. Though these are full and concise, the interest of the volume lies for one on this side of the Atlantic not so much in these features as in the glimpse it affords of the excellent, earnest work for the welfare and advancement of the natives which here, as elsewhere by Britons on the outposts of the empire, is being done in building and guarding and guiding well their Britain beyond the seas. B. H.

Baedeker, K *Great Britain.* Karl Baedeker, Leipzig, 1906.
Baedeker's "Great Britain" appeared revised and augmented in a sixth edition in 1906. There have been four new maps and nineteen new plans added in this edition. The editor of "Great Britain" is fortunate in having had for the writer of the volume J. F. Muirhead, M.A. Everybody who has used Baedeker's "Great Britain" will testify to the accuracy and excellence of the volume.

Baddeley, J. B., B.A. *Ireland—North and South.* Two volumes. Dulan & Co., London.
These two neat pocket volumes are crowded with information and well illustrated by folding maps, and are as complete as the most exacting traveler could desire.

Bradley, A. G. *Canada in the Twentieth Century.* Pp. 428, E. P. Dutton & Co., New York. 1904.
In the preface the author states: "My aim is to try and give some picture of life in the older provinces, and to treat of the Northwest in the only fashion one very well can treat a country in the making within brief compass." The first five chapters are devoted to a brief history of the Provinces of Quebec and Ontario, followed by an account of the present conditions existing there, all with a view to inform the English at home of the country, people and possibilities. One most interesting part of the book is that found in the latter chapters treating of the Northwest, its wonderful growth and the future opening before it. The book is well illustrated and has a good map.

Chamberlain, Basil Hall. *Things Japanese.* Notes on various subjects connected with Japan for the use of travelers and others. Fifth edition, revised. Pp. 552. John Murray, London. 1905.
As a comprehensive book of reference on all "Things Japanese," the neat volume bearing this title fills a long-felt need, and covers ground which has heretofore been left vacant to the inquiring student or tourist. It contains valuable information on everything connected with Japan—persons, customs, government, and so on—and the alphabetical arrangement, from abacus to zoölogy, makes the subject matter readily accessible by being conveniently grouped in concise form. The author has added a list of books to be consulted if the reader is particularly interested in any one

subject and wishes to enlarge his knowledge of it, and the names of the books recommended are subjoined to the final paragraph of the article. A good map of Japan in provinces adds to the interest of the book. Mr. Chamberlain may feel satisfied that he has given the public what was wanted, as this fifth edition of "Things Japanese" has already been demanded.

L. B.

Dubois, Abbé J. A. *Hindu Manners, Customs and Ceremonies.* Translated from the author's later French manuscript and edited, with notes, corrections and biography, by Henry K. Beauchamp, C. I. E., Fellow of the University of Madras; with a prefatory note by the Right Hon. F. Max Müller, and a portrait. Pp. 741. Third edition. Oxford, at the Clarendon Press, 1906.

This third edition of the revised work of the Abbé Dubois has been carefully translated and annotated by Henry K. Beauchamp, Fellow of the University of Madras, but its easy style makes one forget that it is a translation from the Frenchman's manuscript. From its earnestness and minute recital of every phase of Hindu life, and its vivid descriptions of the ceremonies and superstitions which envelop that life, it is evident that such accurate information could be obtained only at first hand. This is certified by the statement of the good abbé himself, that for thirty years he lived as a missionary among the Hindus, adopting their garb and winning their respect and confidence in so far as the eastern mind is capable of understanding western thought and principle.

Although since the abbé's time many changes for the better have occurred, such as the abolition of the suttee, or widow-burning, and the car of Jagannath no longer being allowed to crush its victims. Yet, in the main, what he has written will stand as a text book for all time for fanatical religious ideas and the existence of caste necessarily prohibit progress, and the millions of Hindus living to-day are in all essentials like those of a century ago. The abbé, with that conscientious minutæ of detail which he considered his duty has left nothing to the imagination, and any one may consult this book as a trustworthy authority on matters appertaining to Hinduism.

LAURA BELL.

Fraser, John Foster. *Pictures from the Balkans.* Pp. 291. Cassell & Co. New York, 1906.

The author of "The Real Siberia" has given us another valuable book portraying the actual conditions in a region which has occupied a prominent place in world politics during the last half decade. The Balkans country has had the eyes of the whole Christian world focused on it because of the Bulgarian and Macedonian massacres; and the question of what is to be done with Turkey in Europe still remains to be settled. Mr. Fraser gives an intensely interesting picture of the conditions of life and politics in the Balkan States. Some of his revelations will be of a startling nature to the average reader, such as the fact that "most of the murdering now going on in the Balkans is by Christians of Christians" in the process of converting the people from the Greek Church to the Bulgarian Church, or *vice versa*, "at the dagger's point." At first the reader will be inclined to feel that the author exaggerates, but the inclination to question vanishes with the dawning realization of the cheapness of life among these peoples whose whole attitude is that of primitive man—where people "occasionally die from ordinary disease, but most of them die from differences of opinion"—and where in a town of twenty thousand people twenty or thirty murders a week are the usual thing.

The explanation of the conditions lies in the character of the country—mountainous and difficult of access—with separate clans under separate leaders in the different valleys. But part of the conditions must be laid at the door of the Turkish government, which, at least in name, holds sway over much of this country.

The political problems as set forth by the author lend especial value to the book, for the fate of Turkey is still to be decided. As Mr. Fraser aptly says, the average man wonders why the Great Powers do not agree to remove the Turk, as a ruler, out of Europe. It would be easy enough to agree on the Turks removal, but not on who should have the Balkans when the Turk goes. Russia and Austria have eyes on Constantinople and Salonica. Germany waits quietly, hoping that Austria will succeed, for through the fall of the Austrian Empire Salonica would easily become a German port.

It is well worth reading the book for the understanding it gives of this most perplexing of the present-day problems in European politics. Mr. Fraser believes that war is apparently the only solution, with a mere glimmer of hope for peaceful settlement in the formation of a Balkan confederation with the Turks a party to the confederation. The present methods are but makeshifts postponing the explosion which seems almost inevitable.

W. S. T.

Harvie-Brown, J. A. *Travels of a Naturalist in Northern Europe.* With colored plates, maps and other illustrations. Pp. 541.

This book of 541 pages is the narrative of an ornithologist, and while written in a pleasing style, it is essentially a work of very considerable permanent scientific value. Journeys for the purpose of collecting and studying birds were made into Norway (1871), Archangel (1872), Petchora (1875). Valuable lists are given of the specimens seen and collected and their habits studied as opportunity afforded. The ornithological specimens in the museum at Archangel were examined and the rarer species listed. While these journeys were made by an ornithologist, other things of interest to the naturalist were by no means neglected. The animals and plants of the regions traversed were studied. The book also has very considerable of moment in it for the edification of the geographer, traveler or ethnologist. The countries and their inhabitants are described, the Samoyèdes being particularly studied. Those living on the Tundra east of Petchora are mentioned, along with an account of the great herds of reindeer on which they are dependent. As a contribution to the study of ornithology the work is excellent. As a narrative of travel and exploration it will appeal to those not specially interested in the main subject. The real value of the book is not depreciated by the manner of its presentation, and it is works like this that create a liking for the study of nature.

HENRY SKINNER.

Libbey, W. and Hoskins, F. E. *The Jordan Valley and Petra.* Vol. I. Pp. 353. Putnam, New York. 1905.

The interest attaching to this region because of its historical associations is enhanced by the presence of geographical and geological conditions of unique character. The difficulties experienced by intending travelers in obtaining official countenance for journeys by way of the pilgrimage road east of the Jordan interfere with considerable exploration of that vicinity, so that current information concerning such eastern region is neither extensive nor accurate. This work, which is an account, profusely illustrated, of a journey on horseback through Jordan and Petra, is, therefore, timely and useful. Volume I sets forth steps taken to secure the necessary permission, and the organization of an exceptionally well equipped entourage, and describes in detail the progress from Sidon to Kerak, by way of Jaulan, Galilee, Gadara, Jerash and Madeba.

In connection with the story of the trip, the physical and scenic aspects of the country traversed and the relation of places visited to events in sacred and profane history are discussed with an illuminative touch. A vivid impression is conveyed of the wealth of material for the archæologist and historian to be found among the ruins and buried cities. The translation of the Moabitish stone, the description of Jerash, and the discussion of the course and features of the Jordan, will challenge especial attention. It is interesting to learn that the finest specimen of an ancient Greek city extant is found not in Greece but in the ruins of Jerash, and furthermore that in the region visited is situated the castle Kerak, said to be by far the grandest monument now existing of crusading energy.

F. NORMAN DIXON.

Olufsen, O. *Through the Unknown Pamirs.* Pp. 229. (The second Danish Pamir Expedition.) William Heinemann, London, 1904.

The foot of the traveler in our day leaves few localities uninvaded. Asia, long the mysterious continent, second only in secrecy to Africa, the dark continent, has become well known during the century past, and now its mighty mountain regions, with their almost impenetrable recesses and impassable ridges, are being vigorously attacked. A late expedition, that led by the Danish explorer O. Olufsen, has made its way into the heart of that vast and lofty plateau, the Pamirs—the "Roof of the world," in political mid-Asian phrase—and has laid bare many mysteries of its untraveled depths. In "Through the Unknown Pamirs" we are given the more interesting results of this expedition, which followed the difficult ravine traversed by the Paudsh River, the chief head stream of the Oxus. The route followed was in various places very nearly impassible, the vast precipitous walls of the Hindu Kush and the Pamir Mountains rising well nigh vertically on either side to thousands of feet in height. Yet in this wild region there dwells a people, a sparse population fairly out of the world, buried in the mountain's heart, living in absolute ignorance of what is going on outside, cultivating its narrow fertile spots and pasturing their herds on the grassy plateau regions above. Pure Iranians in race, a deposit left behind by the people who ages ago migrated to and developed an empire on the Persian highlands, this flotsam of a great race retains many of its primitive habits, superstitions and beliefs. Nominally Mohammedan in faith, their religious ideas are in a measure a survival of the old faith of their Aryan forefathers. They have not been left at peace in their close seclusion. The land hunters of the world, Afghan, Bokharan and others have not been content to let even such a God-forsaken country alone, and now Russia has invaded its depths and claims the north bank of the Paudsh as its southern Asiatic boundary. Such is the region which Prof. Olufsen has intelligently studied, and concerning the geography and population of which he has given us some highly interesting and valuable particulars.

Charles Morris.

Pensa, Henri. *L'Avenir de la Tunisie. Protectorat-Colonisation.* Librairie Africaine et Coloniale. Paris, 1903.

This is an exhaustive study of the past, present and future of Tunis. It is also a serious arraignment of the mistaken policy which has hitherto been pursued by the French protectorate in this country. The conditions of climate, population and soil are similar to those of Algeria, and greater progress would have resulted had the same policy been carried out in Tunis that has been effective in other French colonies. But this has been regarded as a colony existing for the benefit of France rather than for colonization. The permanent settlement by French colonists has been slow, and the colonization by Italians from Sicily or Malta who desire to come in ever increasing numbers has been discouraged by discriminating taxes. The author proves by exhaustive statistics that the soil is now quite unfit for the cultivation of cereals, although this used to be called the granary of the Roman Empire. Grape culture has been extensive and successful, but its very over production militates against French vineyard owners becoming rich. The olive industry is the most promising of all the agricultural products. The country's mineral resources consist mainly of phosphates and lead ores. Absence of coal beds preclude any great extension of manufactures. In twenty years the French government has expended 400,000,000 francs in Tunis. It has established a French population of 24,000. So far no material return has been made to the mother country except the enrichment of a few companies and individuals. The financial soundness of the country has been re-established. This was the original aim and reason for the establishment of the protectorate. Railroads have been built, harbor improvements inaugurated, impartial courts of justice have replaced the native courts of injustice, and many French companies have received charters and encouragement.

The finest lands have been ceded to French colonists, where the laborers are mostly Italians. But the native population has been left in ignorance of all modern improvements for cultivation of the soil or for its primitive industries, and they cannot compete with manufactures which are flowing in from other countries. The raising of cattle, sheep, goats and camels is also diminishing every year. Although public schools have been established with modern methods, instruction is not obligatory, for the Mohammedans and their own schools and universities are encouraged and strengthened by various laws regarding examinations, and no sciences are taught the followers of Mohammed. Radical reforms are imperative in every department of administration if Tunis is to develop at all; all progress is arrested and retrogression seems to be the doom of a country which under enlightened rule might share in the prosperity of Algeria. Such is the conclusion of the author of this most interesting work. Many other important points are dwelt upon, and a reading of the book is necessary for an adequate appreciation of the subject.

M. C. Le B.

Philios, Demetrios. *Eleusis: Her Mysteries, Ruins and Museum.* Translated from the French of Demetrios Philios, Director of the Excavations (1882-1894). By Hamilton Gatliff. Sidney Appleton, London.

Doctor Philios has thrown much light upon the history of Eleusis through his extensive excavations. Indeed, his small, but comprehensive, volume, "Eleusis," would serve as a valuable guide book. Very briefly the early history of Greece is reviewed. Eleusis is presented as a rival of Athens; later as under the Athenian yoke; still later as reasserting herself and becoming a fortified town.

While the greater part of the book is devoted to the description of his excavating work, Doctor Philios still has space to explain in considerable detail the celebration of the Eleusian mysteries. Nine good plates of the excavated region and a map accompany this admirable work.

Rachel P. Barker.

Sandberg, Graham. *Tibet and the Tibetans.* Published by the London Society for Promoting Christian Knowledge, 1906.

Perhaps the best review of this book can be given by a brief sketch of the life of the author in its relation to "the forbidden land," as it will explain his peculiar fitness for presenting to the public a comprehensive analysis of Tibet and the Tibetans. In 1886 Mr. Sandberg went to India as a chaplain of the Church of England, and his long residence there, particularly in Darjeeling, in close proximity to Tibet, gave him his desired opportunity to study the language, literature and natural history of that unknown country. His earliest article, which appeared in 1889, was followed by a series of papers and books concerning the land of his literary choice, and he was engaged in the preparation of this volume when death put an end to his labors. The revision of the proofs of the last two chapters as well as the list of contents was entrusted to L. D. Barnett, who conscientiously holds himself repsonsible for any criticism that these concluding pages may evoke. Mr. Sandberg says in the preface to his book that it is an epitome of the results of many years of personal investigation. The subjects treated of are the unique physical features of the country, its geology, botany and zoölogy, also the characteristics, occupations, religion and literature of its inhabitants. Much of the matter was put in type before the recent political mission to Tibet, which revealed few new facts. The book is the work of a student, and is consequently a valuable addition to the world of literature.

Scandlin, Christiana. *Hans, the Eskimo.* Silver, Burdett & Company.

A delightful child's story of the second Grinnell expedition to the far North in 1853 is found in "Hans, the Eskimo." The story is imaginary only in detail. Hans Christian, Dr. Kane's devoted hunter, an Eskimo of Fiskenaes, Greenland, is supposedly telling his little boy, Tobias, of a strange people of the mysterious Southland. These stories, as told by Hans, have as their background, a little Greenland village, and contain many interesting pictures of Eskimo home life. It is hard to imagine the child who could read this little book without wishing to be an Eskimo or, at least, wishing to "play at" being one.

Turner, Samuel, F. R. G. S. *Siberia: A Record of Travel, Climbing and Exploration.* With an Introduction by Baron Heyking. Pp. 420. Illustrated. George W. Jacobs & Co., Philadelphia.

The author of this attractive and finely illustrated volume, on a business trip to Siberia, incidentally explored the higher Altai Mountains. After an arduous journey, he gained the summit of Willer's Peak (17,800 feet), the highest peak in Siberia, never before attained, and later ascended Beluhka, another peak of the Beluhka and Katunski Belki ranges. The book makes no scientific pretensions, beyond recording the altitudes, describing the passes and glaciers and mapping the mountains discovered and ascended. The remaining portion of the book describes the author's Siberian experiences and gives a list of 811 plants recorded by Prof. Sapoznikoff from the Siberian Alps.

JOHN W. HARSHBERGER.

Van Dyke, John C. *The Opal Sea.* T. Werner Laurie. London, 1906. This is a delightful book on oceanography, and is as happy in the vivifying treatment of scientific facts as the title is in the picturesque suggestion of ocean color.

There is a short account of the part the ocean has had in the history of the older nations, then a restatement, in most attractive prose, of the laws that govern the movements of the waters, ocean and air currents, the results of these movements, the give and take of land and sea, the power of the "wave's tooth" and the grace of the creatures of the "wind's will." The scientific imagination has played so delightfully over the life of the ocean that the depths and wastes are filled with animation. The microscopic and the gigantic creatures which live in the ocean gardens or on ocean uplands, as well as the amphibious and feathered creatures which rest by or upon its bosom, are described with equal interest.

The charm of the book is in the appreciation for color, for the splendor of the sea. Dread of the ocean is disappearing, as we realize its beauty and majesty. The same change took place in the feeling for the mountains. A century and a half ago writers described the mountains as stern, cruel: so many even now speak of the ocean. We are gaining in appreciation of the ocean's purpose, uses and beauty, and "The Opal Sea" will stimulate this appreciation.

MAUDE BINGHAM HANSCHE.

Wheeler, A. O., F.R.G.S. *The Selkirk Range, British Columbia.* Vol. I. Pp. 459. Vol. II (now in press) maps, diagrams and plates. Ottawa, 1905. The Department of the Interior.

This admirable work contains the first measurably complete and authoritative report on the region embraced in the Selkirks, particularly the more accessible portions. Its author, Mr. A. O. Wheeler, Topographer to the Department of the Interior of the Dominion of Canada, has been in the field in Western Alberta and Eastern British Columbia for a number of years past. The book gives us the results of some of his strenuous labors. The subject is divided under four general headings: The Survey, Travel and Exploration, Previous Surveys, and Mountaineering in the Selkirks, whilst copious appendices include such subjects as a Table of Altitudes; Notes on the Natural History of the Selkirks, by John Macoun; Notes on the Geological Structure of the Selkirk Range by the late Dr. George M. Dawson; Short Description of the Canadian Pacific Railway, etc.

There is an excellent and readable, though technical description, of the actual work of Mr. Wheeler's own survey, followed by a historical sketch covering the work of others, surveyors, scientists, explorers and mountaineers. Throughout, the author shows himself to be a master of his subject, both from the scientific and the popular standpoint, and with true Anglo-Saxon spirit, he gives credit to others who have been working in the same field. His characteristic modesty respecting what he has personally accomplished is a refreshing contrast to many books of exploration. There are nearly 100 illustrations, of a great variety of subjects—flora and fauna, mountain views, railroad construction, portraits. These are mostly excellent, and include the work of Mr. Wheeler, as well as of a number of professional and amateur photographers, most of the botanical subjects being from the splendid collection of Mrs. Charles Schäffer, of this city. The introduction of so many half tones is responsible for the heavy grade of glazed paper employed, which makes the weight of the book an almost uncomfortable burden.

Vol. II is not issued, being held back for the completion of a large topographic map which will show contours, water, snow, ice, trails and timber. There are also several interesting and valuable outline sketches, showing routes to important summits, names and elevations of peaks, etc.

Taken as a whole "The Selkirk Range" is not only an important contribution to American geography, but will prove invaluable to the discriminating tourist who wants an attractive and accurate descriptive work respecting the region he is visiting.

George Vaux, Jr.

Recent Accessions to the Library of the Society.

AFRICA.

Africa.

Notes on the Geology of the continent of Africa. Compiled in the Department of the General Staff, War Office. London: Wyman & Sons, Ltd., 1905. Illustrations and Maps. *Presented by the Department of the General Staff. To be Reviewed.*

British East Africa.

Handbook for East Africa, Uganda and Zanzibar. 1906. Printed at the "East African Standard" Printing Press; Mombasa. *Presented by the "East African Standard." To be Reviewed.*

Gambia .... **Archer**

The Gambia Colony and Protectorate. An Official Handbook. By Francis Bisset Archer. London: St. Bride's Press, Ltd. (1906). Illustrations, Maps and Plans. *Presented by the Publishers. To be Reviewed.*

Natal.

Climbing Natal by Rail and Road. Durban: Printed by Singleton, 1905. Illustrations. *Presented by the Alpine Club.*

Nigeria.

Northern Nigeria. Report for 1904. Colonial Reports, No. 476. London: 1905. *Presented by the Colonial Office.*

Sahara .... **Baader**

Nach der Oase Tugurt in der Wuste Sahara. By Walter Baader. Basel: Buchdruckerei Kreis, 1903. *Presented by the Publishers. To be Reviewed.*

Sudan .... **Giffen**

The Egyptian Sudan. By J. Kelly Giffen, D.D. New York: Fleming H. Revell Company, 1905. Illustrations and Maps. *Presented by the Publishers. To be Reviewed.*

Tunis .... **Pensa**

L'Avenir de la Tunisie. By Henri Pensa. Paris: Librarie Africaine et Coloniale, 1903. *Presented by the Author. To be Reviewed.*

AMERICA, NORTH AND CENTRAL.

Alaska—Geography and Geology .... **Brooks**

The Geogpraphy and Geology of Alaska. By Alfred H. Brooks. (U. S. Geol. Surv., Prof. Paper No. 45. Washington: 1906. Illustrations and Maps.

CALIFORNIA—GEOLOGY .... ARNOLD
The Tertiary Quaternary Pectens of California. By Ralph Arnold. (U. S. Geol. Surv., Prof. Paper No. 47.) Washington: 1906. Illustrations.

CANADA—GEOLOGY.
Annual Report of the Geological Survey of Canada for 1901 and 1902-3. Ottawa: 1905 and 1906.

KANSAS—HYDROLOGY .... SLICHTER
The Underflow in Arkansas Valley in Western Texas. By Chas. S. Slichter. (U. S. Geol. Surv., Water Supply Paper No. 153.) Washington: 1906. Illustrations and Maps.

KENTUCKY—GEOLOGY .... ASHLEY AND GLENN
Geology and Mineral Resources of part of the Cumberland Gap Coal Field, Kentucky. By George Hall Ashley and Leonidas Chalmers Glenn. (U. S. Geol. Surv., Prof. Paper No. 49.) Washington: 1906. Illustrations and Maps.

MEXICO—GEOLOGY.
Guide Géologique au Mexique. 10e Congrès Géologique International 1906. Mexico: Imp. du Ministère de Fomento, 1906. *Presented by Henry G. Bryant.*

MEXICO—STATISTICS .... PEÑAFIEL
Anuario Estadistica de la Republica Mexicana 1904. Collected by the Direccion General de Estadistica in charge of Dr. Antonio Peñafiel. Mexico: 1906. *Presented by Henry G. Bryant.*

NICARAGUA .... BAADER
Dutch Nicaragua. By Walter Baader. Basel: Buchdruckerei Kreis, 1906. *Presented by the Publishers.*

PANAMA .... FORBES-LINDSAY
Panama. The Ithmus and Canal. By C. H. Forbes-Lindsay. Philadelphia: The John C. Winston Company, 1906. Illustrations, Map and Plan. *Presented by the Publishers. To be Reviewed.*

UNITED STATES—CALIFORNIA.
Preliminary Report of the State Earthquake Investigating Commission. Berkeley: 1906.

UNITED STATES—GEOLOGY ....HEWETT
Antiquities of the Jemez Plateau, New Mexico. By Edgar L. Hewett. Smithsonian Institute, Bureau of American Ethnology, Bulletin 32. Washington: 1906.

UNITED STATES—HYDROGRAPHY .... VARIOUS AUTHORS
Report of the Progress of Street Measurements for the Calendar year 1905. Parts 1, 2, 4, 5 and 7. (U. S. Geol. Surv., Water Supply Papers Nos. 165, 166, 168, 169, 171.) Washington, 1906. Maps.

UTAH—HYDROLOGY .... RICHARDSON
Underground Water in the Valleys of Utah Lake and Jordan River,

Utah. By G. B. Richardson. (U. S. Geol. Surv., Water Supply Paper No. 157.) Washington: 1906. Illustrations and Maps.

UNITED STATES—MASSACHUSETTS .... SEARS

The Physical Geography, Geology, Mineralogy and Paleontology of Essex County, Mass. By John Henry Sears. Salem: The Essex Institute, 1905. *Presented by The Essex Institute.*

UNIITED STATES—METEOROLOGY .... MOORE

Report of the Chief of the Weather Bureau for 1904-05. By Willis L. Moore. Washington: 1906.

UNITED STATES—MISSOURI.

Seventeenth Annual Report of the Missouri Botanical Garden. 1906. St. Louis: 1906.

AMERICA—SOUTH.

BRAZIL .... ARTHUR

Ten Thousand Miles in a Yacht. By Richard Arthur. New York: E. P. Dutton & Co., 1906. Illustrations and Maps. *Presented by the Publishers. To be Reviewed.*

DUTCH GUIANA .... CAPPELLE

Au travers des Forêts Vierges de la Guyane Hollandaise. Par H. van Cappelle. Paris: C. Béranger, 1905. Illustrations and Map. *Presented by the Publisher. To be Reviewed.* Price 20 fr.

SOUTH AMERICA .... PEPPER

Panama to Patagonia. By Chas. M. Pepper. Chicago: A. O. McClurg & Co., 1906. Illustrations and Map. *Presented by the Publishers. To be Reviewed.*

ASIA.

CEYLON .... FERGUSON

Ceylon in 1903-5. By John Ferguson. Colombo: A. M. and J. Ferguson, 1903. Illustrations. *Presented by the Publishers. To be Reviewed.*

CHINA .... MERZBACHER

The Central Tian-Shan Mountains. By Dr. Gottfried Merzbacher. Published under the authority of the Royal Geographical Society. London: John Murray, 1905. Illustrations and Map. *Presented by the Royal Geographical Society. To be Reviewed.*

CHINA .... RICHARD

Gèographie de l'Empire de Chine (Cours Superieur). By L. Richard. Chang-Hai: Imp. de la Mission Catholique à L'Orphelinat de T'Ou-Sè-Wè, 1905. Maps and Plans. *Presented by the Publishers. To be Reviewed.*

INDIA .... ABHEDANANDA

India and Her People. By Swami Abhedananda. New York: The Vedanta Society, 1906. *Presented by the Publishers. To be Reviewed.*

INDIIA .... HAVELL

Benares, the Sacred City. By E. B. Havell, A.R.C.A. Glasgow: Blackie & Son, 1905. Illustrations. *Presented by the Publishers. To be reviewed.*

JAPAN .... CHAMBERLAIN

Things Japanese. By Basil Hall Chamberlain. New York: Chas. Scribner's Sons, 1905. *Presented by the Publishers. To be Reviewed.*

KOREA .... GENTHE

Korea, Reiseschilderungen von Dr. Siegfried Genthe. Herausgegeben von Dr. George Vegener. Berlin: Allgemeiner Verein fur Deutsche Literatur, 1905. *Presented by the Publishers. To be Reviewed.*

KOREA .... HULBERT

The Passing of Korea. By Homer B. Hulbert. New York: Doubleday, Page & Co., 1906. *Presented by the Publishers. To be Reviewed.*

PALESTINE .... LIBBEY AND HOSKINS

The Jordan Valley and Petra. By William Libbey and Franklin E. Hoskins. New York: G. P. Putnam's Sons, 1905. Illustrations and Maps. Two vols. *Presented by Wiliam Libbey. To be Reviewed.*

PERSIA .... GLEADOWE-NEWCOMEN

Report on the British Indian Commercial Mission to Southeastern Persia during 1904-5. By A. H. Gleadowe-Newcomen. Calcutta: 1906. *Presented by the Upper India Chamber of Commerce.*

PAMIRS .... OLUFSEN

Through the Unknown Pamirs. By O. Olufsen. London: William Heinemann, 1904. Illustrations and Maps. *Presented by the Author. To be Reviewed.*

SIBERIA .... DUCROCQ

Du Kremlin au Pacifique. By George Ducrocq. Paris: H. Champion, 1905. Illustrations. *Presented by the Publisher. To be Reviewed.*

SIBERIA .... TURNER

Siberia: A Record of Travel and Explorations. By Samuel Turner, F.R.G.S. Philadelphia: George Jacobs & Co., 1905. Illustrations and Maps. *Presented by the Publishers. To be Reviewed.*

TIBET .... LANDOR

Tibet and Nepal. By A. Henry Savage Landor. London: A. and C. Black, 1905. Illustrations. *Presented by the Publishers. To be Reviewed.*

TIBET .... SANDBERG

Tibet and the Tibetans. By Graham Sandberg. London: Society for

Promoting Christian Knowledge, 1906. *Presented by the Publishers. To be Reviewed.*

EUROPE.

BALKANS .... FRASER

Pictures from the Balkans. By John Foster Fraser. New York: Cassell & Co., Ltd., 1906. *Presented by the Publishers. To be Reviewed.*

ENGLISH LAKE DISTRICT .... WORDSWORTH

Wordsworth's Guide to the Lakes. Fifth edition (1885). By William Wordsworth. With an Introduction, etc., by Ernest de Selincourt. London: Henry Frowde, 1906. Illustrations and Map. *Presented by the Publisher. To be Reviewed.*

FRANCE .... FULLERTON

Terres Francaises. Bourgogne, Franche-Comte, Narbonnaise. By W. Morton Fullerton. Paris: Armand Colin, 1905. *Presented by the Publisher. To be Reviewed.*

ITALY .... ALLEN AND CRUICKSHANK

Grant Alen's Historical Guides. Florence. New Edition, revised and enlarged by J. W. and A. M. Cruickshank. New York: A. Wessels Company, 1906. *Presented by the Publishers. To be Reviewed.*

NORWAY .... RUDGE AND NIELSEN

Norwegen. By Prof. Dr. Sophus Ruge and Prof. Dr. Ungvar Nielsen. Bielefeld: Velhaqen and Klasing, 1905. Illustrations. *Presented by the Publishers. To be Reviewed.*

SICILY .... RICCÒ AND ARCIDIACONO

L'Eruzione dell'Etna nel 1892. Vol. I. By A. Riccò and S. Arcidiacono. Catania: C. Galàtola, 1904. Presented by the Director of the R. Osservatorio de Catania ed Etneo.

SWEDEN.

Sweden. Edited by the Swedish Tourist Traffic Society. Translated by Edward Adams-Ray. Stockholm: 1908. *Two copies presented by the Svenska Turistforeningen and the Bibliothèque de l'Université Royale d'Uppsala.*

SWITZERLAND .... WHYMPER

A Guide to Zermatt and the Matterhorn. By Edward Whymper. London: John Murray, 1897. Illustrations, Maps and Plans. *Presented by the Author. To be Reviewed.*

UNITED KINGDOM—IRELAND .... BADDELEY AND WARD

Through Guide Series. Ireland (Pts. 1 and 2). By M. J. B. Baddeley and C. S. Ward. London: Dulau & Co., 1902 and 1906. Maps and Plans. *Presented by the Publishers. To be Reviewed.*

OCEANICA.

PHILIPPINES .... LE ROY

Philippine Life in Town and Country. By James A. Le Roy. New York: G. P. Putnam's Sons, 1906. Illustrations and Map. Price $1.20 net. *Presented by the Publishers. To be Reviewed.*

POLAR REGIONS.

ARCTIC .... MECKING

Die Eistrift wus dem Bereich der Baffin-Bai beherrscht von Strom und Wetter. By Dr. Ludwig Mecking. (Veroffentlichungen Instituts fur Meereskunde und des Geographischen Instituts, Heft 7, Jan., 1906). Berlin: Mittler & Son, 1906. *Presented by the Publishers.*

GEOGRAPHY.

STUDY OF .... FRYE

First Steps in Geography. By Alexis Everett Frye. Boston: Ginn & Company, 1908. Illustrations and Maps. *Presented by the Publication Committee.*

STUDY OF .... MALTE-BRUN

Malte-Brun's Universal Geography. Vol. I. By M. Malte-Brun. Philadelphia: Anthony Finley, 1827. Plans. *Presented by Miss Naomi Walter.*

SCIENCES.

VOLCANOES .... RECLUS

Les Volcans de la Terre (first vol.). By Elisée Reclus. Eruxelles: Société Belge D'Astronomie, 1906. Maps and Diagrams. *Presented by the Soc. Belge D'Astronomie.*

STATISTICS.

The Statesman's Year Book. 1906. Edited by J. Scott Keltie, LL.D. New York: The Macmillan Co., 1906. *Presented by the Pubilsher. To be Reviewed.*

TRAVELS.

TRAVELS .... BOURNE

The Voyages and Explorations of Samuel de Champlain (1604-1616). Edited by Edward Gaylord Bourne. New York: A. S. Barnes

& Co., 1906. Illustrations and Map. Two vols. ***Presented by the Publishers. To be Reviewed.***

The Opal Sea. By John C. Van Dyke. New York: Charles Scribner's Sons, 1906.

MAPS.

UNITED STATES AND CANADA .... BARTHOLOMEW

New Map of the United States and part of Canada, 1905. Edinburgh: John Bartholomew & Co. ***Presented by the Publishers.***

Pilot Charts of the North Atlantic Ocean for July, August, September, October and November, 1906.

Pilot Charts of the North Pacific Ocean for July, August, September, October, November and December, 1906.

KINGSTON, THE CAPITAL OF JAMAICA, AS IT WAS AND IS

By Helen Christine Bennett.

Ruined by earthquake and fire, Kingston, a crumbling heap of stones and debris, lies trembling, awaiting and dreading the tidal wave that may bury her beside her sister city, Port Royal, submerged by a similar disturbance three centuries ago.

A few months ago the tourist, seeking rest and relaxation under a tropic sun, found the quaint old town abounding in interest and amusement. Apparently Kingston, like Topsy, "just growed." The streets were laid out at right angles, but there any system stopped. The twelve thousand buildings serving as homes, stores and warehouses for the sixty thousand inhabitants, were dropped here, there and everywhere. King and Harbor Streets, the two main thoroughfares, boast irregular, uneven flagged sidewalks, connected by small flights of steps, making walking at night so dangerous that pedestrians prefer the well-paved roads. Passing through Harbor Street, possibly the first building to attract attention was the new Jippa Jappa hat factory, an indication of recently awakened activity, where over a hundred girls were employed in the manufacture of "Panama" hats. Several blocks east of the factory lay the shopping and business district. The warehouses of Emanuel Lyons' Sons, at the corner of King and Harbor Streets, storage houses for hardware, tools and government supplies; the Woman's Exchange, Gardner's book store, Crosswell's drug store, etc., lined the way to the fashionable shopping district, where attractively displayed goods in bulk windows enticed the "rich Americans." The Beehive, Fashion House, Pawsey's and the Metropolitan were the principal stores, the latter the most pretentious shop in town, resembling a miniature clothing store in Harlem, but doing an enormous business in the tourist season.

East of the shopping district stood the postoffice and the dreaded courthouse. To the peasantry, the courthouse was a place to be reverenced and dreaded as the direct manifestation of the English law. They stood in awe of the quaint unpretentious building, and few of them, unless under compulsion, ever ventured within. The courtroom proper occupied the second floor. It was a large lofty rooms, with paintings of former judges hanging on its walls. The be-wigged judge, and equally be-wigged barristers were seated upon a railed platform. Tourists visiting court were also invited to take chairs upon this platform, a rather embarrassing position, but the affairs of court were carried on in tones so low that if seated without the rail they were inaudible, hence the general public, if curious enough to visit the courtroom, heard little if any of the case in hand.

North of the courthouse stood the Jamaica Museum, containing interesting collections of native minerals, corals, woods, etc., and curious instruments of torture from the days of the Spanish occupancy of the island.

Passing through King Street, the second main thoroughfare, intersecting Harbor Street and running north through the city, the first object of interest was the public garden and parade. Directly south of the gardens was the Parish Church, to the east the Jamaica Theatre, to the west the Victoria Market. To the north and east of the parade lay the residence district, usually one-story buildings of brick and plaster set within walled gardens, and invisible from the road through their screen of tropical plants. Toward the east the more pretentious residence section terminated in the Myrtle Bank Hotel, a favorite tourist resort. Toward the north, across the city line through the Parish of St. Andrew, lay many beautiful homes surrounded by extensive grounds set with cocoanut palms, tamarinds, limes, catalpa and various flowering plants, with a profusion of roses just coming into blossom. Past "Retirement Road, The Half Way Tree, Mary Brown's and Matilda's Corner" the road leads to the famous Constant Spring Hotel, the finest building south of the Hotel Titchfield at Port Antonio.

About four miles north of the city, at the very feet of the mountains, are the Hope Gardens, a magnificent public park and nursery, maintained by the Jamaican Government. The total area of the gardens is sixty acres, thirty of which are laid out as public grounds, the other half being used as an experiment station. The beauty of the gardens beggars description. Groups of magnificent trees are

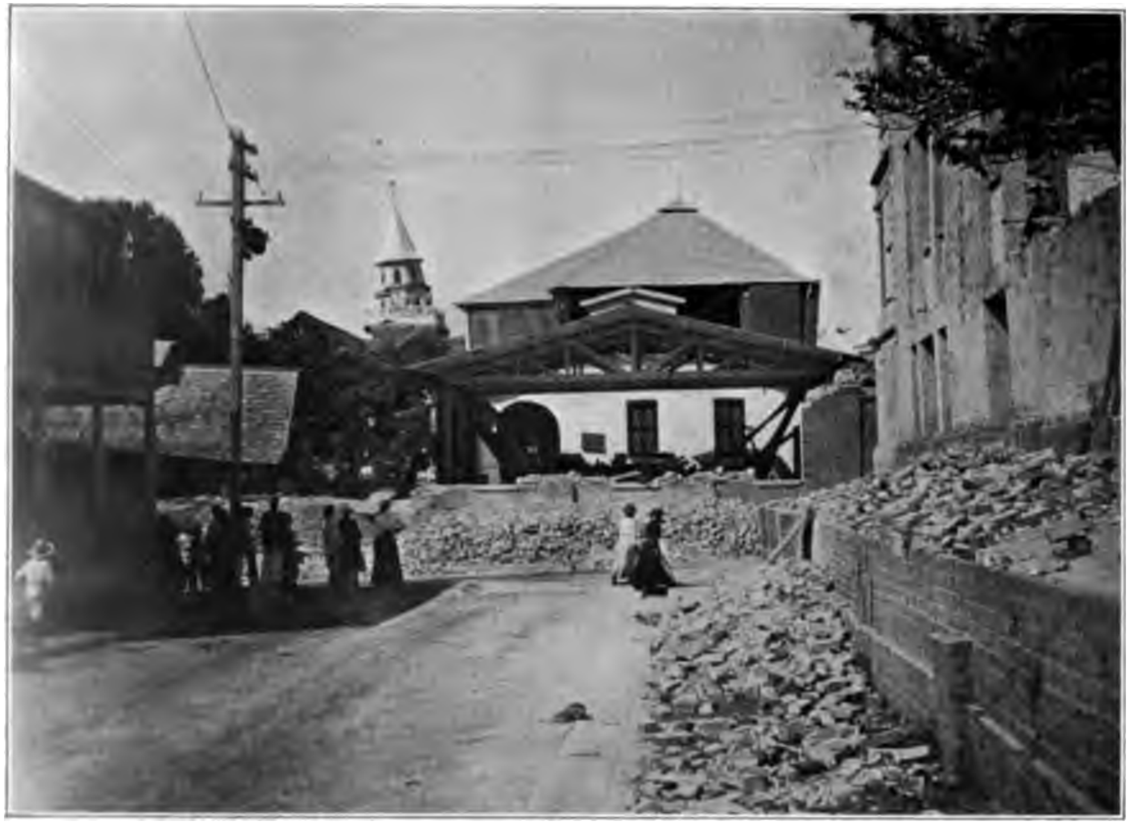

Fig. 1.—Laws Street—Looking East.

interspersed with long arbors hung with orchids and covered with flowering vines, over which humming birds are flittering. Large beds of pointsetta set here and there among the dark green shrubbery give a touch of brilliant color. The experiment station contains groups of coffee, sugar cane, broom corn and other native plants, while the nursery holds several million young trees to be sent out by the government through the agricultural districts.

The tourist season at Jamaica opens about the middle of January. Special midwinter festivities are always planned for the season, beginning with a public reception at the governor's residence, "King's House," and followed by the annual "King's House" ball. This year the reception immediately preceding the ball was held on Saturday, January 12th. Governor Swettenham, a tall, fine looking Englishman of about sixty years, received the guests upon the lawn. By his side was his beautiful young wife. The mayor of Kingston, James Tait, and Mrs. Tait presided at the tea table. To American eyes the contrast between husband and wife was startling Mayor Tait was a handsome, well-groomed Englishman, his wife a full-blooded negress. Mrs. Tait wore a gown of bright green satin, with an over-dress of yellow lace. Upon her head was a hat of the mushroom style. Large gold hoops hung in her ears, while beneath her lace mitts costly rings glittered. Even amid the tropical surroundings she was a striking figure.

Monday, January 14th, the day of the earthquake, dawned without any unusual atmospheric conditions. Peasant women, bearing upon their heads baskets laden with yams, akees, bananas and cocoanuts, lazily swung down the roads toward the markets, where they dispensed their wares, amid a babble of voices uttering words unintelligible to English ears. The streets were thronged with people. Tourists, looking for curios, and vendors of seed chains, "American" candy and native fruit drinks crowded the uneven sidewalks. Although the afternoon was extremely warm, there was no cessation in the steady stream of people.

Suddenly, without warning, the earth shook violently. The whole city rocked and trembled. Buildings crashed against each other and went down in ruins. A cloud of dust filled the air and covered everything as with a fog. When it lifted, men, women and children, who had rushed to the streets, ran for their lives from the fire which burst out upon every side, while groans and shrieks from the piles of debris told of hundreds imprisoned in the ruins, unable to escape the death which with the flames crept nearer and nearer.

The first shock occurred at 3.40. It was followed immediately by two others, almost as violent, the three lasting about thirty seconds. During that time, practically every building in the city was ruined, those still standing being so rent and cracked that it was impossible to enter. The fire followed the quake immediately, so that the wounded, except in the outlying districts, had little chance of escape. There were many hair-breadth escapes. One man, an employee of the Metropolitan House, was on the second floor when the shock came. The roof fell upon his head, and, bearing a portion of it on head and shoulders, he went through the floor to the ground. Still carrying the portion of roof which served as a protection against flying bricks, he was able to rescue several women before the fire drove him from the ruins. His injuries consisted of cuts, bruises and a sprained ankle.

When the first shock came the Americans, with one impulse, made for the open. The lethargic temperament of residents of the tropics, particularly that of the negroes, accounts for the fact that the percentage of the deaths was smallest among Americans and largest among the blacks.

It was at the military camp that one of the worst features of the calamity occurred. The brick buildings were demolished, and twenty-three white and forty-six black soldiers were burned to death in the fire that followed. Many of these were hospital patients.

The tip of Port Royal sank into the sea, carrying with it six valuable guns. King and Harbor Streets were one indistinguishable mass of bricks and mortar. There was little left for fire to consume, except the human beings underneath the fallen walls. At the Jippa Jappa hat factory thirty-six girls and twelve men perished. No estimate of the number dead could be formed. The streets were thronged with the entire population, families endeavoring to leave the city, mothers searching for their children, children searching for their parents, husbands seeking their wives and wives their husbands. As darkness fell and the glow of the flames lit up the stricken city, the effect was indescribable. Negro women, apparently dazed and careless of danger, sat with their babies in the shadow of some crumbling wall certain to fall with the next shock,

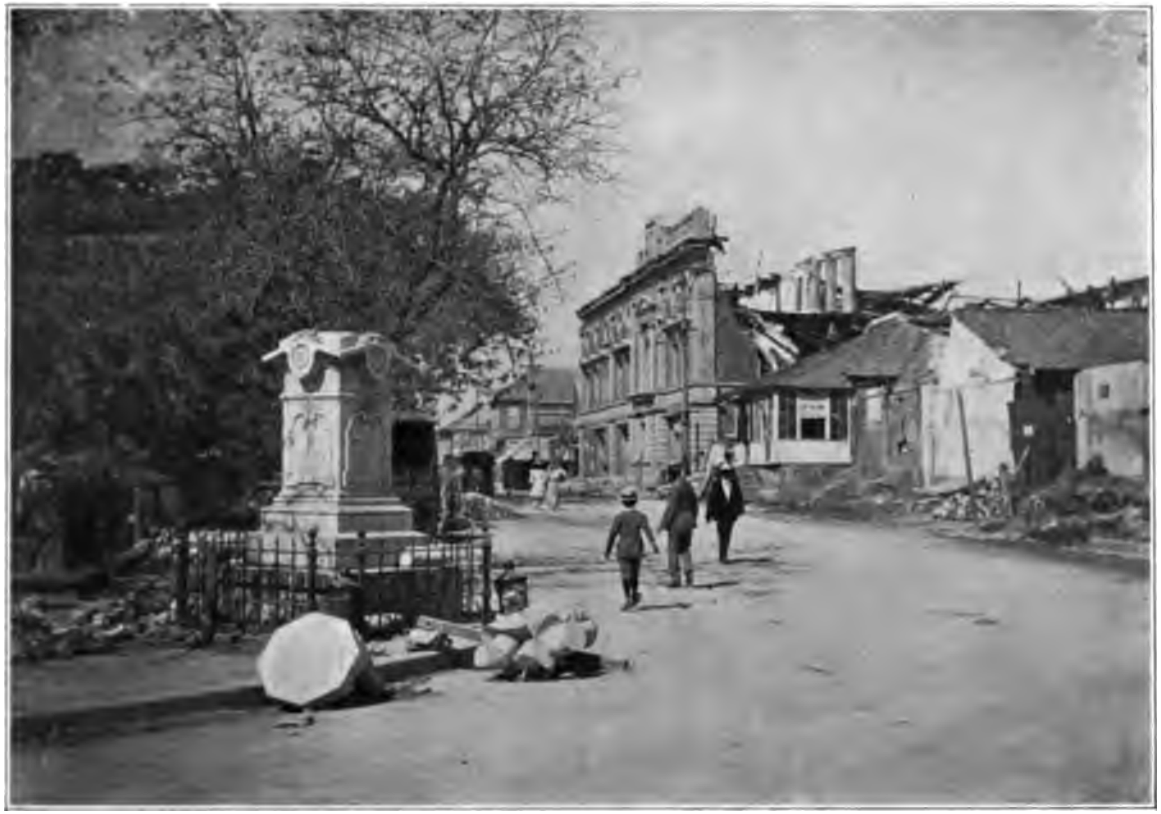

FIG. 2.—PUBLIC SQUARE. SHOWING DESTRUCTION.

and wailed, "O God, have mercy." Voice after voice took up the cry, until it seemed as if the entire city prayed "O God, have mercy." The Seventh-Day Adventists, who had been holding a series of special services in the city, sent their workers among the people, and their shrill voices could be heard above the tumult, "'Tis the day of judgment. The Lord is coming." And the people, as they hastened from the city, bearing upon their heads trunks, stoves, tables, grotesque and weird pictures in the light of the flames, echoed the cry as they went on

"'Tis the day of judgment. The Lord is coming."

The public garden afforded a resting place for hundreds of families. Gathered in groups, with the portion of their goods saved from the wreck about them, they wept, and cried, and sang, through the long night.

People, utterly exhausted, fell asleep in the middle of the roads. The streets contained many of the injured, laid upon the stones where all houses had fallen, the only place of safety. The shocks continued at intervals of two hours. Fallen wires and loose piles of debris made passage through the streets still more dangerous. The fire spread with inconceivable rapidity. By the light of the flames it was possible to ascertain the extent of the damage wrought. The Myrtle Bank Hotel was a ruin. All the outer walls had fallen, leaving the rooms exposed. Park Lodge suffered in a like manner.

The front wall of the Jamaica Theatre stood intact, facing the public gardens. The remainder of the building was a heap of debris. The Jamaica Club, the Colonial Bank, the courthouse and all the principal buildings were total wrecks.

In the suburbs the damage was almost as complete. Hundreds of beautiful homes lining the roads to Hope Gardens and Constant Spring were so damaged that they were unfit for dwellings. The Constant Spring Hotel suffered comparatively little damage, as the main portions of the structure were of wood. The nursery at the Hope Gardens suffered severely. Many of the valuable seedlings and potted plants were utterly destroyed. The mountain paths leading to Gordon Town and Newcastle were unsafe. Huge boulders blocked the roads, while bridges were torn from their foundations and railings disappeared over the precipitous sides. Great consternation was manifested by the peasantry at the sight of the Hope River, a beautiful crystal stream, which suddenly became dark and muddy.

The other portions of the island suffered but slightly. At Mandeville the shocks were felt, but little damage was done. The Hotel Titchfield, at Port Antonio, was slightly damaged.

When Tuesday dawned the fire was under control. The Hamburg-American dock, which had been saved from the flames by the heroic work of the sailors, led by Captain Richard Vahsel, of the ill-fated Princessin Victoria Louise, became a haven of refuge for American tourists. The dock had suffered no injury from the earthquake, but the earth in front of the entrance had cracked, leaving two long fissures about four inches in breadth. The Port Kingston, an English vessel, which had brought Sir Alfred Jones and his party to the agricultural conference then being held at Kingston, was the only large vessel in the harbor. All night long the Port Kingston had served as a temporary hospital, to which the bodies of the wounded were carried. The heroic work of that night aroused the admiration of the American refugees, several of whom acted as assistants to the operating surgeon.

As the cable connection had been severed, there was no means of communication with the outside world save through the steamers. The President, a small steamship, left the island in the morning, carrying with her hundreds of cablegrams sent by the tourists.

All through the day the steady march from the city continued. The majority of the residents went to the race course, a large tract of ground about four miles from the city. The tents of the Tony Lewando circus, which had arrived at the island a few days before the quake, gave shelter to hundreds. Black, white, injured and dying were huddled together. Medical aid was not obtainable. Food was scarce. Little children begged for something to eat. Several of the more enterprising natives went to the sea and caught fish, which they cooked over small fires of wood and brush. The wails and calls of the negroes never ceased. For three days the refrain of hymns sung could be heard all over the city. Many women and children became hysterical from the long-continued strain. During the day there were two distinct shocks and several faint tremblings. The sun shone red through the cloud of smoke

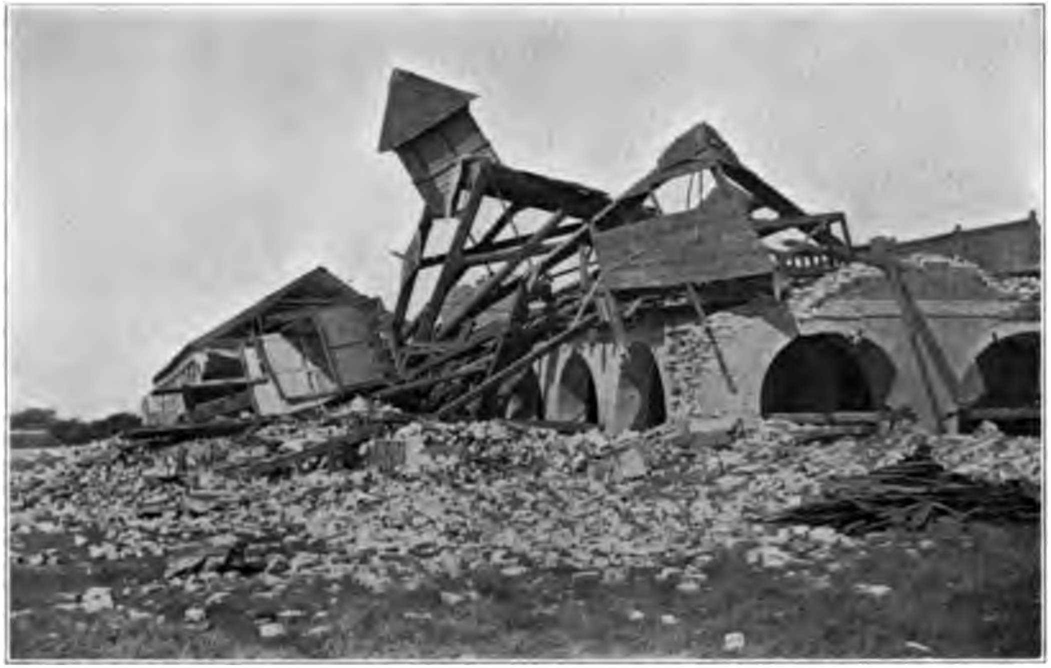

FIG. 3.—SCHOOL CHAPEL CAMP.

rising from the smouldering ruins, and to the wail, "O God, have mercy," was added a new cry:

"It is a sun of blood. We are to die."

At four that afternoon, when the majority of the men in the party of American refugees on board the Port Kingston had gone to the city to attempt to recover their effects, all foreigners were summarily ordered to leave the vessel. Although the women pleaded with the officials, it was useless. The American party crossed to the Hamburg-American dock, while the injured remaining on the vessel were put upon the railway wharf. The steamer was then prepared to receive Sir Alfred Jones and his party, together with some of the English officials. There was no food obtainable, save oranges, crackers and cheese. As the number of women was few, they were provided with the mattresses from the Victoria Louise. The men slept upon sacks of coffee or on the floor of the dock.

During the second night the shocks were frequent. The light from the fire was but faint and heavy clouds hid the stars. Residents in the suburban portions of the city slept upon mattresses on the lawns, as even the piazzas seemed unsafe.

Wednesday found the town under a semblance of military rule. The militia were placed through the city, and the following proclamation was issued by the governor:

Proclamation. "The governor calls upon all persons to obey the police, keep the peace and abstain from looting, under penalty of condign punishment."

J. A. SWETTENHAM, Governor.

January 16, 1907.

The work of removing bodies had begun the day before. Unless some relative or friend was at hand to identify a body, the blacks were piled in carts, hauled to the outskirts of the city and burned. Where the bodies were charred stumps, as was frequently the case in the burned district, it was almost impossible to identify the remains. Bands of negroes moved through the streets, smilingly stealing anything they could, and as smilingly holding the object up for inspection. When they encountered the constabulary or militia they were forced to relinquish their gains, but both the militia and the thieves seemed to regard the matter as a jest; and, having been relieved of his gains, the looter proceeded upon his way, doubtless to repeat the performance elsewhere. The inmates of the insane asylum, which had been wrecked, strolled aimlessly about the streets and added to the general confusion. Their presence was a boon to the looters, for every thief who was caught was immediately recognized by the loungers about as an inmate of the asylum, and as such the constabulary had no power to detain him. Now that the dreaded courthouse had been destroyed, the natives seemed to have no fear. "Courthouse him all gawn," they whispered joyously. "Courthouse him all gawn."

The few shops where provisions were still obtainable were mainly those of the coolies in the suburbs. These were boarded and locked, and the long line of purchasers received their goods through a hole cut in the door. The trains were running, and food began to arrive from other portions of the island.

The party of American refugees had by this time increased to one hundred and twenty, about one-third of whom were women. The Waldemar was hourly expected, but when night fell there was still no sign of her. That night men and women slept on trucks, trunks, sacks or bits of sail. About 10.30 in the evening a small boat brought the cheerful news that two American men-of-war would arrive in the morning. The strangely assorted company had just fallen asleep when signals from the Waldemar told that she was aground. As the lighthouse was destroyed and no lights were visible from the town, the captain lost his bearings and ran upon a reef not one hundred yards from the Victoria Louise. The Port Kingston signaled in return and the refugees jumped up in alarm, fearing another shock. One man who came through the earthquake uninjured sprained his ankle as he jumped from the pile of coffee sacks upon which he had been sleeping. The news of the wreck of the Waldemar produced very little impression. It seemed in accord with the other calamities.

Promptly at ten o'clock on Thursday the Indiana and Missouri entered the harbor. Some time elapsed before a boat was lowered, but when it reached the dock and the officers inquired "Where are the Americans?" the reply that came was almost a shout. "We are all Americans," and no group of Americans under any circum-

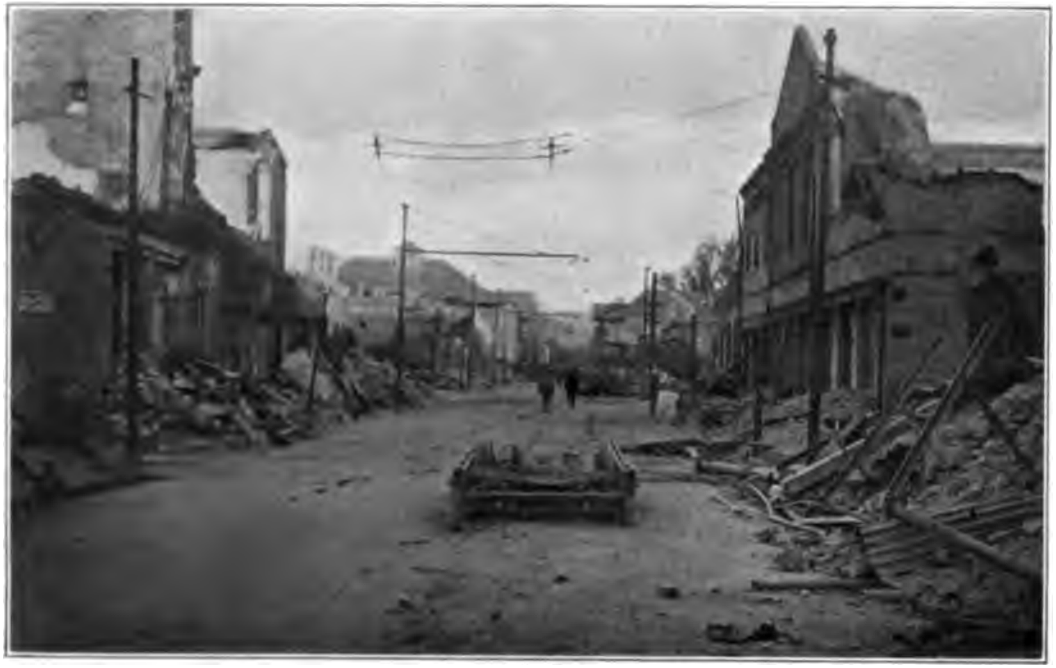

FIG. 4.—HARBOUR STREET—LOOKING EAST.

stances could have been prouder of their nationality. Food was supplied immediately, and the women were invited to board the Indiana. Those who did were received with the kindest care and attention, and for the first time in four days succeeded in bathing and dressing. Great indignation was manifested when it was known that the offer of tents and provisions had been declined. Even the negroes at the dock held a little meeting after the arrival of the United States marines, and afterwards went about muttering what was a concensus of opinion.

"Englishman no good, no how do nothin'; American gemman, him know what him doin'," which was as complete a description of the situation as could have been given.

The arrival of the Prinz Eitel Frederich, about four o'clock that afternoon, brought new life to the refugees. The captain consented to take the entire number, and the crowd of weary people prepared for the journey home. Even fatigue could not prevent the passengers from cheering themselves hoarse as they passed the ships of our country.

Letters and papers since received from the stricken city tell many pitiful stories. Mayor Tait died some three weeks after the quake as a result of injuries received. At the time of the shock he was conducting a meeting of the city council. The building collapsed and he was badly injured. Governor and Lady Swettenham were forced to leave King's House, as the building was in a dangerous condition. The indignation of the citizens of Jamaica at the conduct of the governor necessitated his resignation.

Food is again plentiful and the merchants have secured many of the wooden shanties in the suburbs and have endeavored to resume business. The work of clearing away the debris will occupy months. Contributions of tents, blankets, lumber and building materials are constantly arriving, but the work of reconstruction promises to take years. The larger number of the well-to-do citizens have purchased tents and are living on their lawns.

The papers have a cheerful tone, which, under existing conditions, is heroic. The whole island, while saddened and subdued by the calamity, is facing the weary years to come with a courage that is worthy of commendation. Under the influence of this spirit the new Kingston rising from her ruins will become a fair and beautiful city, worthy of her name.

SETTLEMENTS AND CLIMATE OF THE SEWARD PENINSULA, ALASKA*

By PHILIP S. SMITH.

On May 28, 1867, by the ratification of a treaty with Russia, an area was added to the territory of the United States nearly a fifth as large as the entire area of the States up to that time. In recognition of the services of the former Secretary of State, William H. Seward, who, in the face of extreme opposition, conceived and executed this project, it seemed fitting that a portion of the new territory should bear his name.[1] The area to which the name Seward has been applied is a peninsula forming the extreme western part of the mainland of the North American continent. It embraces an area of approximately 20,000 square miles, which is only slightly less than the combined areas of the States of Massachusetts, Connecticut and New Jersey, or one-half the size of Pennsylvania. But while the combined population of Massachusetts, Connecticut and New Jersey is about 5,000,000, Seward Peninsula has only about 5,000 residents, thus emphasizing the important geographic control of location.

The various navigators who visited Seward Peninsula up to the middle of the nineteenth century left no settlements of any permanent character as records of their visits, and for the purposes of the present paper they do not need further consideration. Those, however, interested in the historical steps which have led to the exploration and development of Alaska in general, will find much interesting material in a paper by Brooks[2] on the geography of Alaska.

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[1] In regard to the name Seward Peninsula, the following facts may be of interest. In 1869 Dall proposed the name Kaviak for this peninsula, but the name never appeared on any map. In 1898 Governor Brady suggested the name Seward, but the name was not published by him. On the map of Brooks and Schrader, published in 1900 in the report on the Nome gold fields, the name Seward Peninsula first appeared. In 1900 the names Sumner and Nome were published by commercial companies. Owing, however, to the priority of Brooks' and Schrader's publication and to the fact that various commercial companies had already adopted the name the Board of Geographic Names determined to accept the name Seward Peninsula.

The earliest settlements were those used by the whalers and fur traders. These settlements were generally carefully selected for shelter from storms and ice. As an example of these earlier settlements, which have persisted down to the present day mainly on account of their enjoyment of certain geographical environment with respect to the sea, may be mentioned Teller, on Port Clarence. Shishmaref, on a sand reef off the northern coast, is a collection of huts hardly worthy of the name of town, which owes its position to an inlet through the reefs, permitting small, light draught boats to enter the sheltered lagoon.

Esquimaux settlements were, of course, by no means uncommon when the whites first visited the region. Traders, in order to carry on their traffic with the natives, pitched their tents near the igloos, gradually erected more permanent houses, and thus by slow stages villages of mixed population developed. Towns of this sort are represented by Cheenik, on Golofnin Bay, White Mountain, in the eastern part of the peninsula on the Niukluk River, and Igloo, in the central part on the Kuzitrin. The Cheenik site was determined by the harborage. White Mountain owes its position to the fact that it is at the head of tidewater navigation on one of the largest rivers of the district. At first sight one might expect that Igloo would have found a more promising location at the junction of the Kruzgamepa and Kuzitrin Rivers, where it could command the water communication of a larger area than is afforded by its present site. While this argument is of weight, the intricate network of anastamosing distributary streams where the two rivers join makes the surrounding region so wet and undesirable that a settlement could not be made at this usually most favored geographic position. In consequence, a town was located on the first swell of dry country near this point. Such a place was afforded on the Kuzitrin about four miles above the junction of the two rivers.

While numerous small towns were located prior to 1898, the number of permanent white settlers could almost be counted on the fingers. In 1898, however, gold—that loadstone which draws man three or four feet of water may find shelter. The coast is in a mature state of dissection, with long reaches of nearly straight coastal plain shore line of large radius of curvature, stretching from one rocky headland to another. In spite, however, of the impossibility of finding protection for shipping, the commercial necessity of bringing supplies into this richest of all the Seward Peninsula camps has resulted in the establishment of a city in the least unfavorable position nearest the most productive areas. Such a position has been found in the bight of the coast between two rocky headlands twenty-five miles apart. The slope of the sea floor is so gentle that ocean-going vessels are forced to lie a mile or more from shore and discharge their cargoes and passengers by lighters, as is shown in the accompanying picture. (Fig. 2.) The possibility of protecting the shipping by an artificial harbor formed of giant breakwaters, as has been done under similar conditions at Madras, India, has been suggested. Such an undertaking is not feasible, for the pack of ice which is driven against this part of the coast annually is so destructive that it is doubtful whether any construction could remain uninjured. Therefore vessels must often remain several days steaming head to storm before they can receive or disembark their passengers and freight.

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[2] Brooks, A. H. Geography and Geology of Alaska. Prof. Paper No. 45, U. S. Geol. Survey, Washington, D. C., 1906.

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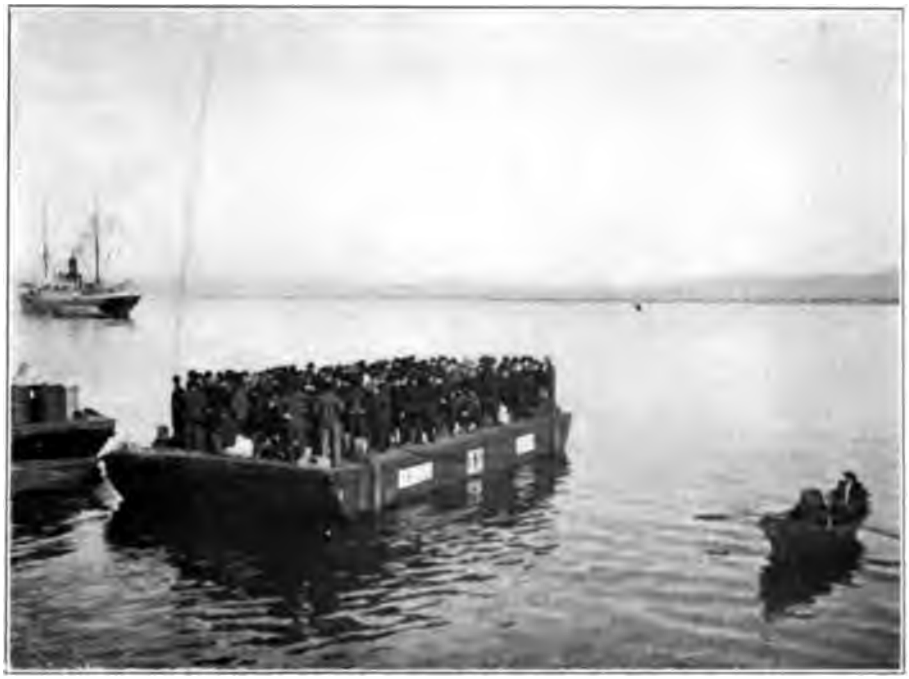

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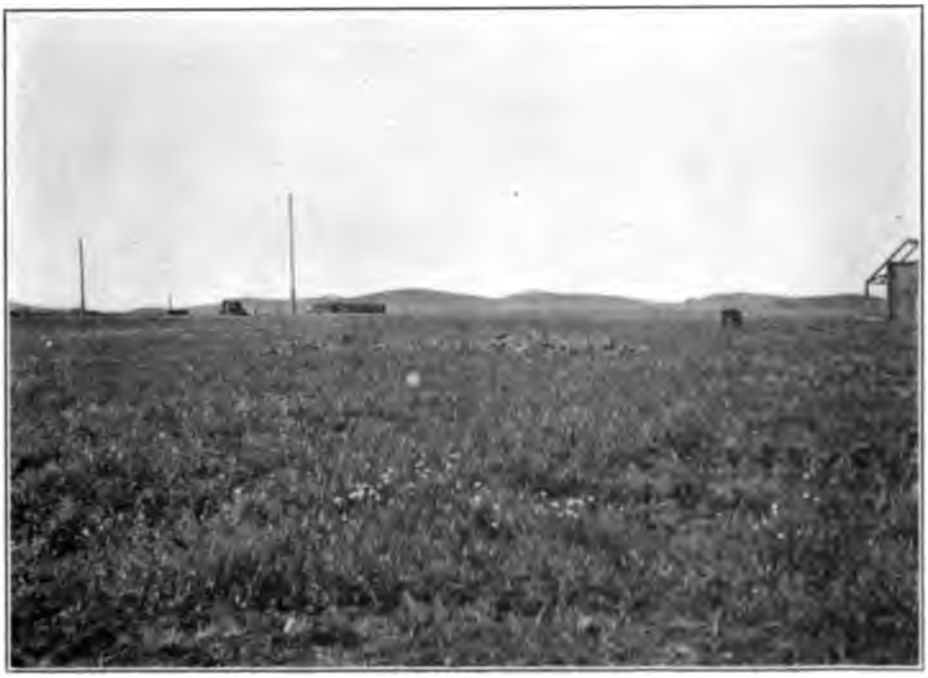

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The absence of trees in the region is also keenly felt, because it necessitates the importation of fuel. The scrubby dwarf willows are green and so small that one is unable to keep warm or do any but the most primitive cooking with them. It is a common saying among the people of the region that a fire of willows serves only to dry other willows, to dry other willows, and so on *ad infinitum.*

So the common fuel throughout the Nome district is coal brought from Washington and Oregon and sold, under the most favorable conditions, for $20 a ton. Even on a camping trip in the past summer we were obliged to carry coal for fuel.

Furthermore, the necessity of importing hay and grain for horses, due to climatic conditions, has led to the extensive use of dogs, either for hauling sleds in the winter or towing boats in the summer, as the weight of food they consume is much less than that required by a horse, and also because their food—consisting of fish, etc.—can be obtained locally.

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The close of winter is announced by the thunderous breaking up of the ice of the rivers and a little later by the withdrawal of the ice pack from Bering Sea. As soon as the ice goes out of Bering Sea the first of the vessels from the outer world is expected, and great are the rejoicings that follow her appearance. The first boat is usually able to reach Nome sometime during the second week of June. From that time until the middle of September it is summer. In June the sun is so nearly above the horizon all the time that it is possible to read newspapers inside a tent even as late as ten or eleven o'clock at night. To the stranger this perpetual daylight, which is a direct result of the globular form of the earth, is one of the most difficult things to which to become accustomed.

The effect of the long-continued daylight upon the temperature is noticeable, especially in the middle of June, during the period

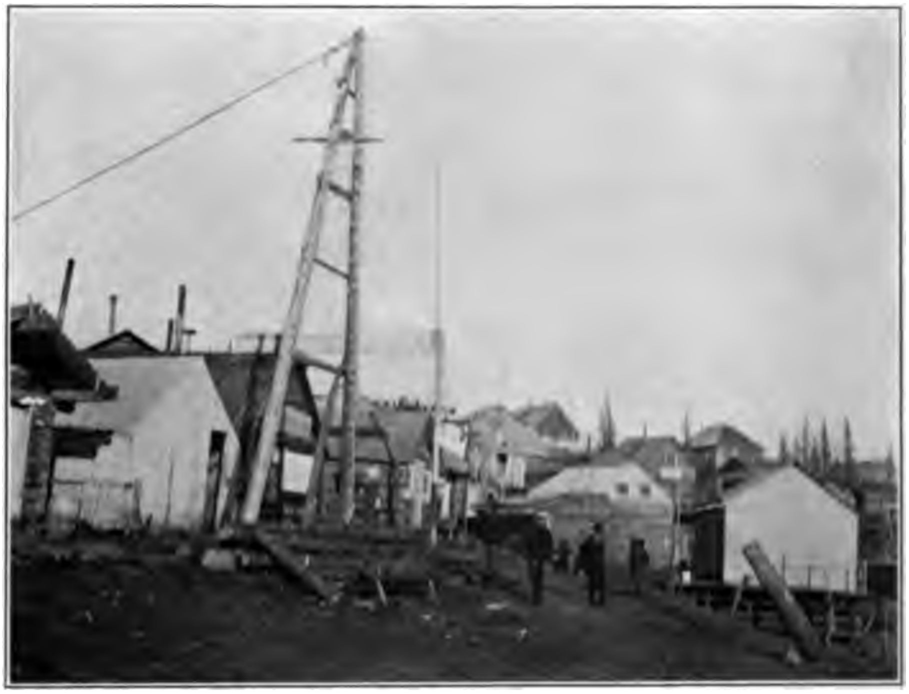

FIG. 4.—COUNCIL CITY.

of longest days. There is noticeably a slighter difference between day and night temperature than in more southern latitudes. It must be remembered, however, that practically none of Seward Peninsula lies within the Arctic Circle; therefore, the sun is below the horizon part of the time even on the longest day, so that there is always some difference between the day and night temperatures.

During the months of June, July and the first part of August the temperature from 7 a. m. to 6 p. m. averages about 50 degrees, so that a person moving about and exercising is perfectly comfortable in a flannel shirt without a coat. From 6 p. m. to 7 a. m. it will average about ten degrees colder than the day temperature. These figures only purport to be approximate and refer to sea level. In the mountains, thirty or forty miles north of Nome, which rise to elevations of 4,000 feet, the temperatures are about ten or twelve degrees lower than at sea level. After the first of September the temperature becomes much colder, jackets must be worn even when exercising, and the hands are uncomfortable without gloves. At night the temperature drops to freezing or below and a rime of frost covers everything each morning. By the middle of September the highest peaks are snow clad and long icicles hang from the sluice boxes and gold saving apparatus of the miners. The small streams begin to freeze. Finally, about the 1st of October, even the larger streams are ice-bound, and winter has arrived.

Unlike Southeastern Alaska, Seward Peninsula has not a heavy precipitation. This is doubtless responsible for the absence of any glaciers except small snow and ice patches a few score yards in length in the higher mountains. While the precipitation is small, most of it occurs in the few summer months, and this often gives a traveler the impression of a wetter climate than is borne out by instrumental observations. During the eight winter months the precipitation, stated as the equivalent amount of water, is rarely an inch a month. During the past summer the precipitation at Nome was approximately six inches for four months. The relief of the surface, however, as is to be expected, influences the amount of precipitation. This fact is shown by gauge readings in the mountains thirty miles north of Nome, where, during the same period, the rainfall was 11.5 inches, or nearly twice as great as at sea level. The plentiful rains and the warmth of the summer season are conducive to the growth of myriads of flowers. The tundra three or four feet of water may find shelter. The coast is in a mature state of dissection, with long reaches of nearly straight coastal plain shore line of large radius of curvature, stretching from one rocky headland to another. In spite, however, of the impossibility of finding protection for shipping, the commercial necessity of bringing supplies into this richest of all the Seward Peninsula camps has resulted in the establishment of a city in the least unfavorable position nearest the most productive areas. Such a position has been found in the bight of the coast between two rocky headlands twenty-five miles apart. The slope of the sea floor is so gentle that ocean-going vessels are forced to lie a mile or more from shore and discharge their cargoes and passengers by lighters, as is shown in the accompanying picture. (Fig. 2.) The possibility of protecting the shipping by an artificial harbor formed of giant breakwaters, as has been done under similar conditions at Madras, India, has been suggested. Such an undertaking is not feasible, for the pack of ice which is driven against this part of the coast annually is so destructive that it is doubtful whether any construction could remain uninjured. Therefore vessels must often remain several days steaming head to storm before they can receive or disembark their passengers and freight.

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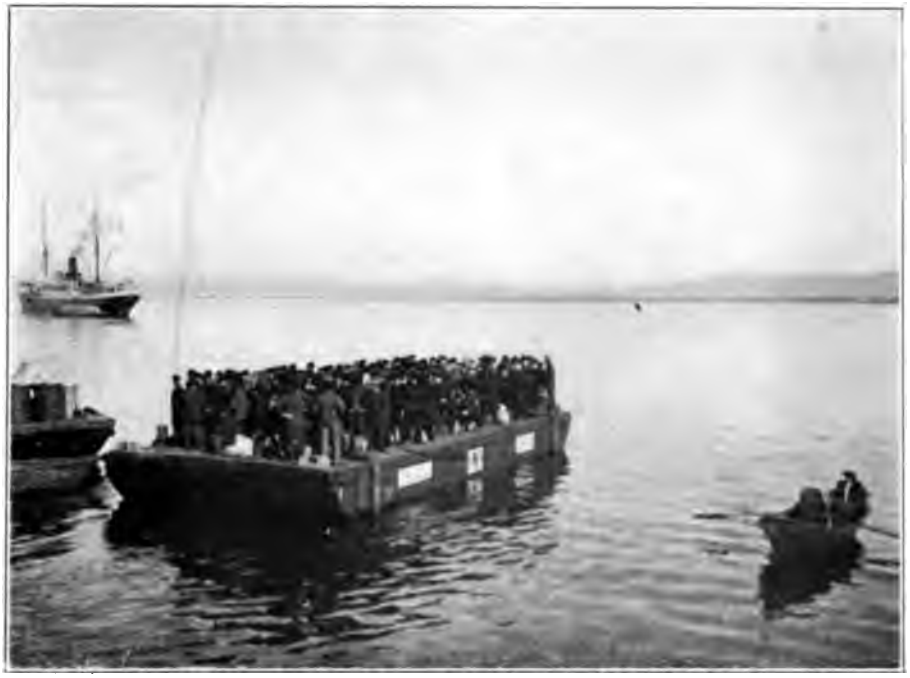

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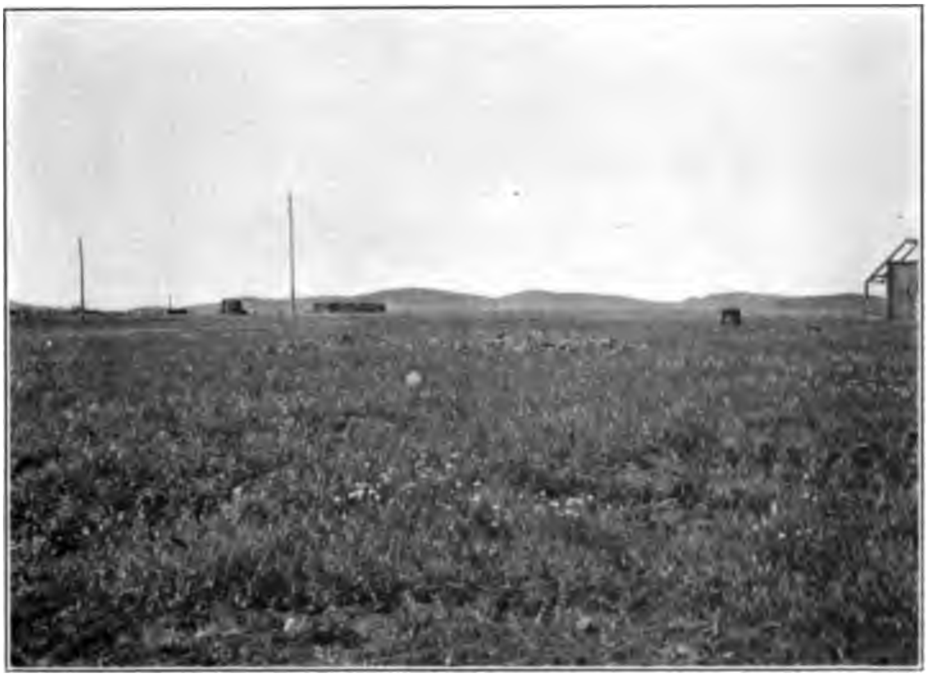

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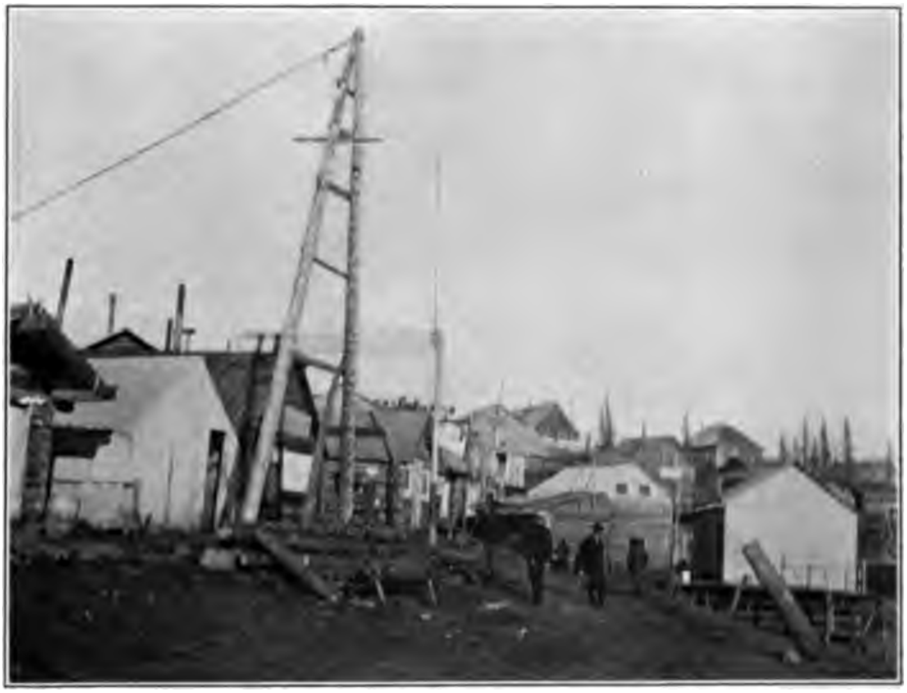

Fig. 4.—Council City.

outline, due to variations in the gentle dip of the strata, different conditions of denudation, and the general thinning out of some of the coal formations. And toward the north the field terminates in six long finger-like basins, representing an equal number of shallow synclinal folds, in which the remnants of the lowest seams still remain, giving the Blossburg, Towanda, Mahoopeny and Ralston fields.

The different attitude of the strata and the consequent different forms produced by erosion have both played significant parts in making a sharp contrast between the character of the bituminous coal industry and the conditions already seen in the anthracite region. The close, high folding which characterized the central province gave place to a series of broad, gentle undulations over the region west of the Allegheny Front, and subsequent base leveling removed the coal measures from only a part of the area. The rise of the strata toward the north resulted in greater beveling of the coal-bearing series in that portion of the field, leaving only remnants of the poorer, lower beds in the separate finger-like basins. Toward the south, however, denudation did not extend deep enough to remove all the coal from the crest of the low anticlines, hence, instead of separate basins, the beds still arch over from one trough to the next. There the measures are thickest and richest.

The result of the different altitude of the strata is that mining in the bituminous fields presents practically none of the difficulties encountered in the anthracite mines. The general absence of close folding means almost none of the irregular variations in the beds as squeezing, bulging and faulting. Moreover, the nearly horizontal altitude, combined with the greater thickness of many of the seams, makes it possible to carry on nearly all the work from a simple tunnel and breasts run in from the hill sides. Slopes are used here and there, but are not common. An important effect of these favorable conditions is that the work of mining is always about the same, with little variation from one year's end to the other. There is not the need for frequent readjustment of the wage scale, but a satisfactory, uniform scale can be adopted, and many labor troubles are thereby avoided.

An element in the physical conditions of no less importance to the coal producer than is the altitude of the beds is the abundance of ravines and valleys which everywhere trench the upland. The valleys represent the entrenchment of streams in courses acquired on the former lowlands, without reference to the flexures in the underlying strata. Thus the development of valleys across the basins containing the coal beds robbed the region of much of the coal left after base leveling was over, but as a compensation the valleys have given easier access to the great stores which still remain. For where the streams have cut down through the coal beds the outcrops appear along the valley sides and make the running of tunnels into the hills a comparatively simple matter. The valleys have been important factors, not only for the development of the mines themselves, but also in affording easy routes of transportation to the markets.

The bituminous fields are at a disadvantage because of their location to the west of the Allegheny Front, with the richest fields lying behind that portion of the Front which is highest and least broken. The greater part of the coal must win its way over the high crest of the escarpment in order to reach its chief markets along the seaboard to the east. The Broad Top field, an outlying field east of the Front, enjoys distinct advantages because of the favorable railroad grades all the way to the markets—but the area is not extensive or rich enough to be of great commercial importance. Within the coal fields themselves, however, topography is more favorable.

Out of the twenty-one principal producing counties three alone, Fayette, Westmoreland and Allegheny, produce more than half the output for the state, or over one-quarter of the total for the whole country. The reasons are distinct enough. The coal measures are there thickest in the state, and the coal is of the finest quality, not only for the ordinary purposes—generating steam and domestic use—but also for coking and for gas. There, just where it would be of the most value, the region has been deeply trenched by the valleys of the Ohio, Monongahela, Youghiogheny and their tributaries. Along both sides of these valleys, and particularly so in the case of the Monongahela and Youghiogheny, the coal is present in unlimited abundance. The outcropping seams are usually at only short distances from the water, as a result of which the coal can be run directly from the mouth of the mine down slides or inclined planes to the barges or the cars below.

The advantages of access afforded by the valleys are shown by the number of mines along the valley sides, by the many small mining villages which have sprung up along the courses of the main rivers, and the railroads which following the winding streams, sending out branch roads into the side valleys to tap the surrounding country. The advantage of slack water navigation on the Monongahela for many miles above Pittsburg has given a great impetus to the mining operations of that region. Coal can be loaded direct from the mines to the barges in which it is carried to the cities along the Ohio and Mississippi as far south as New Orleans. Slack water navigation on the Youghiogheny, however, has not been successful because of ice and floods sweeping away the dams. The difference is apparently due to the higher altitude of the region through which the Youghiogheny flows.

Summary.—Geological structure and physiographic history have been determining factors in the different Pennsylvania coal fields. Close folding gave the different character of the anthracite and added in the preservation of a greater absolute area, but made the mining of it difficult. Absence of much folding aided in preserving large areas of bituminous coal and made mining easy. Base leveling removed vast quantities of the coal from the central region, leaving the small anthracite fields and the larger bituminous fields. Subsequent dissection has been important to give routes of transportation and in the western area to make mining easier. Finally the location of the fields at the northern end of the great Appalachian fields has been a marked advantage, because nearest to the great industrial centers of the country.

Iron and Steel.

The iron and steel industry, the greatest manufacturing industry of the state, is so closely associated with the coal mining industry that they should be treated together. Pennsylvania is the greatest iron and steel making state in the country, with a product in 1900 valued at more than that of all the other iron and steel producing states combined, and more than three times as great as that of its nearest rival, Ohio. The product of the plants in the three cities of Pittsburg, McKeesport and Allegheny alone was equal to that of the whole state of Ohio. In 1900 iron and steel ranked as the first industry in the state, with nearly 300 establishments, representing an average capital of about $1,000,000 each, and with a total product valued at nearly $435,000,000. That Pennsylvania, a state which produces less than 2 per cent of the iron ore mined in the United States, should make more than half the iron and steel for the whole country is an interesting fact. The ore is brought to the fuel, which nowhere else exists so abundantly and so favorably situated as in Pennsylvania.

Pennsylvania, however, has not always been the great iron making state of the present time, though from a comparatively early period the state has ranged first in the industry. The development of the present business has many interesting steps.

As early as 1619 the London company sent workmen to Virginia to set up iron works, and the enterprise was undertaken on a small tributary of the James River near Jamestown, but the works were soon after destroyed by the Indians. The first successful iron enterprise in this country was located near Lynn, Mass., a small blast furnace, completed in 1645, in which bog ore was used. And until the beginning of the eighteenth century, with the use of charcoal fuel for the blast furnaces, Massachusetts was the chief seat of the iron industry in the colonies. Pennsylvania was one of the last of the colonies to begin the development of its iron resources, the earliest record being about 1690, when iron was made as an experiment. The first works were not established until some years later, when, between 1716 and 1718, a forge was built on Manatawney Creek above Pottstown, and a furnace was erected at Colebrookdale, in Berks County. Others soon followed, so that in 1728-9 the colony exported 274 tons of pig iron to England. During the next two decades numerous furnaces and forges were built in Berks, Lebanon, Chester and Lancaster Counties, where the ore could be obtained locally from the pot deposits and "ore banks" in the limestone, where limestone furnished the flux and where wood to supply charcoal fuel was abundant on the neighboring hillsides. And by the middle of the century Pennsylvania began to push ahead as an iron making state, being described in 1756 as "the most advanced of all the American colonies in regard to its iron works." The industry was greatly stimulated by the discovery of rich magnetic iron ore deposits in the Cornwall Hills, near Lebanon, which had been sold some years previous, in 1732, for £500. The extent of the ore deposits, both "ore banks" and in the Cornwall mines, made Berks County an important iron making center previous to the Revolution.

After the Revolution the iron making business received a fresh impulse and was extended into the central parts of the state, furnaces being built in Franklin, York and Cumberland Counties, to take advantage of the iron ores of the South Mountains, and these counties were important all through the first half of nineteenth century. Ore was close at hand, the wooded slopes of the South Mountain range afforded almost unlimited wood for the charcoal used in the furnaces, and abundant limestone for flux was available in the local quarries.

At about the same time, about 1785-1790, there was developed the beginning of a large iron industry in the Juniata region, where the ore deposits in the limestones of the present Centre, Blair and Huntingdon Counties made local supplies easily available. And for many years after the beginning of the nineteenth century Huntingdon and Centre Counties were the principal iron producing districts in the country. The iron being sent to Pittsburg and to eastern cities, partly by packhorses and partly by flatboats, until the completion of the canals previous to 1840. And this prominence was maintained until after the discovery that iron could be made with coal instead of charcoal for fuel. In 1850 there were in these two counties over forty furnaces, about the same number of forges and several rolling mills.

The westward extension of the iron industry seems to have covered all parts of the state at a leap; for along with the development of the industry in York, Cumberland and Franklin Counties is found the development in the Juniata country, and now even further west, beyond the Allegheny Front. The first iron made in Western Pennsylvania was at a furnace in Fayette County, about 1790, with others soon following in the region about Connellsville and Uniontown. So that for many years at the beginning of the last century Fayette County was the great iron center of Western Pennsylvania, supplying large quantities of pig iron and castings to Pittsburg and the town of the Ohio and Mississippi Valleys. In this connection it is interesting to note that the first furnace built near Pittsburg, about 1792, was abandoned soon after it was completed because there was no ore in the vicinity, and the expense of transporting it from neighboring counties was too great. So that the iron industry in Pittsburg, the most important iron center in the country, did not have an existence at the beginning of the last century. After the failure of the first furnace pig iron was not made again in Pittsburg until 1858. Previous to this time, however, there were various foundries and rail factories and rolling mills. In 1813 there were two foundries, one furnace and one rolling mill. In 1836 there were nine rolling mills and eighteen foundries, engine factories, etc. In 1856 there were in Pittsburg and Allegheny County twenty five rolling mills and thirty-three foundries.

We have thus seen how the iron industry extended westward from the eastern counties to the center of the state and across the Allegheny Front to the Pittsburg region following the discovery of local ore deposits. Up to 1830 the great drawback to most of the iron furnaces, particularly in Western Pennsylvania, was the uncertainty of getting the product to market. Most of them had only river transportation, and as this means was often available only at the uncertain times of flood, in numerous instances all advantage of a favorable turn in the market was lost. This condition was remedies to some extent by the system of canals, completed about 1840, which gave somewhat of an impetus to the iron industry. But other factors vastly more important were soon to come in, namely, the substitution of coke and coal for fuel in the furnaces and the introduction of Lake Superior ore.

Previous to 1840 practically all the Pennsylvania furnaces had used charcoal for fuel. A few years before 1840 experiments had been made with coke as a fuel, but its use was only gradual, as seen from the fact that in 1849 there were only four coke furnaces in the whole state. Almost at the same time attempts had been made with anthracite coal as fuel for the furnace, and in 1838 the attempts were successful. The use of anthracite was followed in 1845 by experiments with bituminous coal without previous coking, and they were successful. The anthracite fuel, however, gradually replaced much of the charcoal industry, and for two or three decades was more important than the bituminous coal and gave the iron industry in the east an important impetus. But about 1875 the bituminous was in excess, and in 1900 76 per cent of the pig iron product was made with bituminous fuel—very little raw coal, however, being used now. As the use of anthracite had established the industry in the east, so the greater use of bituminous gradually resulted in the greatest iron and steel centers growing up in the western part of the state, near the regions where good coking coal was abundant.

The second factor in the change of the iron industry was the introduction of Lake Superior ore. The early development of the iron industry in Pennsylvania was due to the extensive deposits of the "limestone" ores in the various parts of the state. These ores were used almost exclusively up to the middle of the last century, and the state ranked high among the iron ore producing states of the country even down to 1899, when it held fourth place. But the local ores have lately supplied only a small part of the blast furnaces of the state, the only extensive mining of iron ore at the present time being in the Cornwall magnetic ore deposits, which in 1903 yielded 400,000 long tons, about two-thirds the total output of the state.

The Lake Superior ore was first used in a blast furnace near Sharon, in Mercer County, about 1853. Two years later the great "Soo" canal was opened, connecting Lakes Superior and Huron, and the development of the extensive Lake Superior ore trade began. For example, in 1903 about 23,650,000 long tons of iron were shipped from the Lake Superior ports, of which 19,681,000 long tons, or more than four-fifths of the total, were received at Lake Erie ports and a large part forwarded by rail to the furnaces of Pittsburg and Western Pennsylvania. In 1900 18,500,000 tons were shipped from Lake Superior ports, 15,800,000 tons were received at Lake Erie ports and over 10,600,000 tons were used in the pig iron furnaces of Pennsylvania.

As a result of these two important changes the use of coal as fuel, with the greater importance of the bituminous as compared with the anthracite, and the introduction of Lake Superior ore, the location of the iron centers in the state has changed. The anthracite coal region, it is well known, is in the eastern part of the state, in Lackawanna, Luzerne and Schuylkill Counties, while the ore deposits are in the east and in the southern parts of the state. And until the middle of the last century the center of the iron manufactures was also in the east. In later years, due to the causes mentioned, the industry moved west, and has developed mainly in the region about Pittsburg. The blast furnaces in Western Pennsylvania are not only better situated to receive the Superior ore, but are also favored by the great supply of excellent coking coal close at hand in the Connellsville region, and by the abundant supply of natural gas, which is used most extensively in the rolling mills.

Present State of Industry.—For over a century Pennsylvania has led the states of the country in the manufacture of iron and steel. From 1880 to 1900 there was a decrease of thirty-five in the number of establishments, but this by no means meant a decline of the industry—it meant in reality a combination of iron interests, as shown by the fact that during the same period the invested capital was trebled. In 1900 the capital invested in Pennsylvania iron industries represented more than half the total for the United States, being approximately $320,000,000. These establishments also gave employment to nearly half the iron workers of the country and paid them more than half the total wages, there being enough wage earners in the iron industry to make a city larger than Scranton, and with an annual wage of $60,000,000. In cost of materials used Pennsylvania represented more than half, and in the value of product the state had 54 per cent of the total for the United States, or more than all other states combined. In 1905 Pennsylvania mineral products, including both metallic and non-metallic, represented more than one-third the total output for the United States, having a value of $570,000,000.

Future.—The future of the iron industry in Pennsylvania seems to point to a continuation of the present supremacy. There is apparently no limit to the supply of iron ores in the Lake Superior region and elsewhere, and there are boundless deposits of good coking coal to supplement those of the Connellsville and Pocahontas fields. It is sometimes claimed that the industry will move to other regions where the raw materials, ore, fuel, limestone, etc., are found together, as in the south, and where transportation charges are light. But the southern ores are poorer than the Lake Superior ores, and therefore require much larger quantities of coke in their reduction; and the cost per ton is higher. With the continued supply of rich ore and cheap water transportation, the great industry of Western Pennsylvania is secure for many years to come.

THE VALLEYS OF THE SASKATCHEWAN WITH HORSE AND CAMERA

By Mrs. Charles Schäffer.

Far away in the northland of Canada there lies a vast area of wilderness almost unknown and unvisited. A large portion of it we might designate as muskeg and mosquitoes, and rest content to pass it by. But reaching the vast upheaval—the Rocky Mountains—where lakes and rivers, waterfalls and glaciers have been formed in reckless confusion, there Nature's lover might wander for weeks with the delightful sensation that his was the first human foot to tread the strange by-ways of this land which has been so long an unknown realm save to hunter, trapper and wandering Indian.

The few scientists or pleasure-seekers who have passed the barriers may be counted on the fingers. In 1884, at the completion of that lone line designated as the Canadian Pacific Railroad, the key to the treasure-land of the hills was ready for any who would use it. Since then it has opened the door to lakes, rivers, valleys and mountains which have been but partially explored and named. So vast, however, is the playground that there is always something new for one who lays aside his comforts for the day and finds his pleasure among the hills with his guide, his horse and his camera.

For the past ten years there has been much said, and three or four interesting books written on the Saskatchewan Country, describing the vast mountains and ice-fields in which the river of the same name has its birth. The particular portion which has claimed so much attention lies roughly between latitudes 51 and 52 degrees 30 minutes and longitudes 116 to 118 degrees west.

With a starting point at the little station of Laggan, which lies about eighty miles west of the first rolling foothills of the Rockies, and drawing a straight line at an angle of about 70 degrees from southeast to northwest, one may follow the general trend of the country mentioned. From Laggan direct to the Wilcox Pass no record exists of any other explorer ever making the journey till

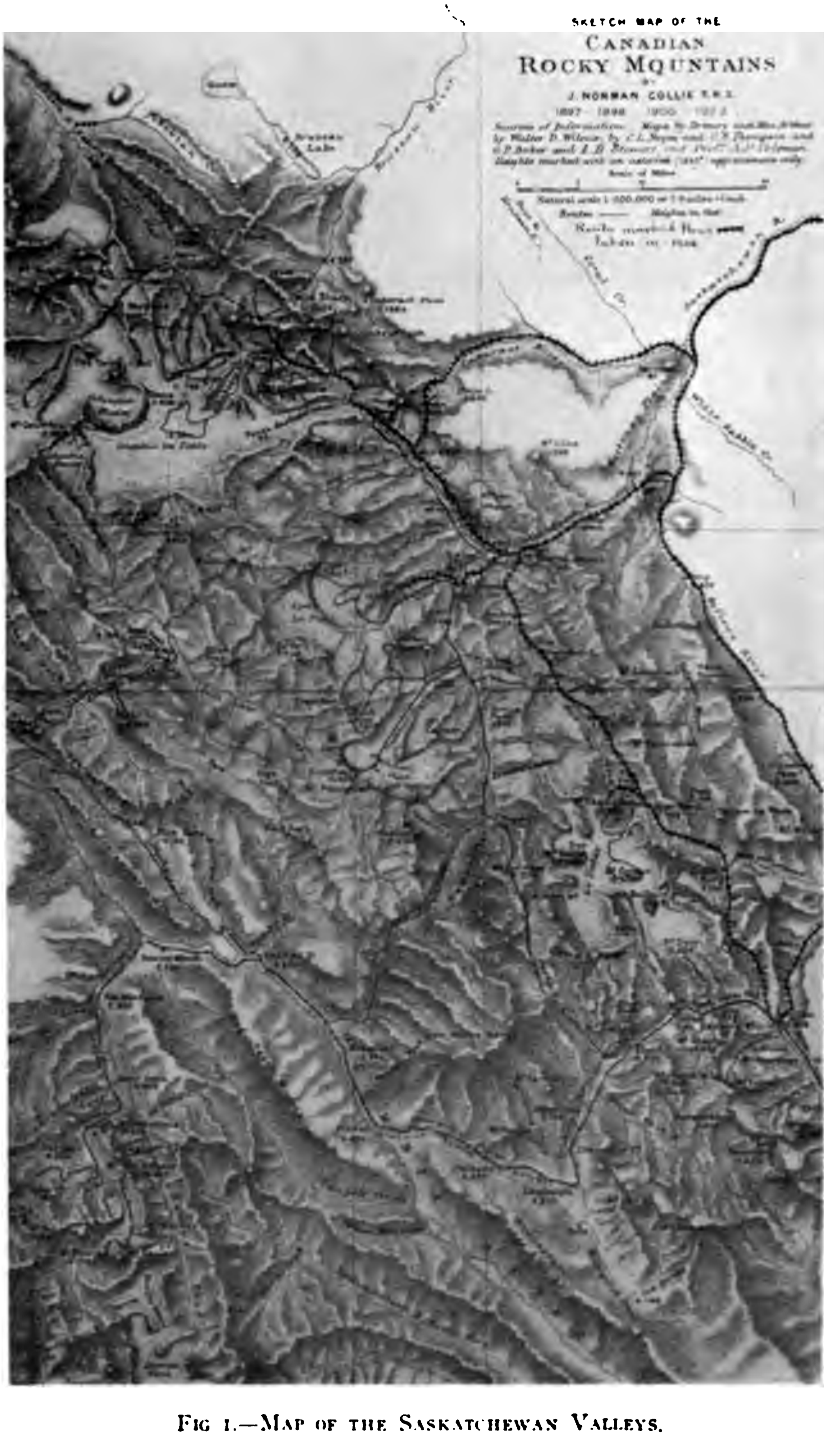

FIG. 1.—MAP OF THE SASKATCHEWAN VALLEYS.

W. D. Wilcox, of Washington, D. C., passed that way on his trip to the Athabasca in 1896. After him came Dr. J. Norman Collie and Hugh Stutfield, experienced English mountain-climbers, whose charmingly written account, "Climbs and Explorations in the Canadian Rockies," is a valuable book for a student of this region, and to which book I am also indebted for the accompanying sketch-map.

Habel, Fay, Thompson, Noyes and Outram are all names closely associated with the mountains in this particular section, every one of them being keen lovers of the heights, tempted there by the wonderful reports of the greater altitudes of the mountains of the Saskatchewan and Athabasca in comparison with the more southerly and accessible ones.

A number of delightful old books (the first dated as far back as 1801), written by men connected with the old Hudson Bay or Northwest Fur Trading Companies, speak of the well-known highway between the plains of the interior and the Pacific Slope—the Yellow-head and Athabasca Passes, and from thence to the Fraser and Columbia Rivers.

Traversing this route has undoubtedly always been a serious undertaking, as, lying in latitude 54 degrees north, the summers are necessarily short and the winters a trial to test the hardiest constitutions. But, as it was a case of rafts, rivers and heavy loads, there was no other practical way found above the United States boundary.

Thus the far-away pass had been frequently traveled at one time, and it was the intervening space which claimed our attention in the summer of 1906. It was all very well to read of the pleasant days spent by the strong, thoroughly hardened mountaineers among the fastnesses, subsisting on bacon and bannock, with a vision of bear and porcupine steak in case of well laid plans failing, but quite another matter when viewed from our own standpoint.

In spite of croakings and warnings, of bad weather and the lateness of the season, it was on the 28th of August that we viewed our entire outfit from the saddle with great satisfaction and saw it settle down to the trail without one qualm for the luxuries left behind. At the head of the band was a guide who in three years of trailing had never failed us. There are older ones, there are better hunters perhaps, with wider experience in forest lore, more knowledge of the country, bnt for kindness, good-nature (such a necessary adjunct), good judgment under unexpected stress, he had no superior.

Our horses had been chosen from the well-known Peyto band—every one sound and in the best condition; and with pride we looked upon the bulging packs containing the food on which we must depend for the next seven weeks. The Canadian Government has included the vast area from the railroad to the Saskatchewan River in a great national park, wisely prohibiting hunting and fishing, thus saving to some extent the fast disappearing game. But this inability to secure game naturally necessitates a much larger supply of provisions to be carried by one passing through so vast a preserve.

From Laggan to the Saskatchewan, during July and August, one usually takes the Pipe-Stone River route to its source, then over the summit of the same name. This pass is about 8,500 feet high, and during the early summer months is a veritable flower garden of Alpine flora. Vetches, the flaming castillea, saxifrages of many varieties, anemones, arnicas and innumerable other plants were found here in the wildest profusion.

On a clear day from the Pipe-Stone summit the view is beyond description. The flowers beneath the feet, the fleecy clouds floating amidst the deep blue, the pure glaciers at our side and the miles and and miles of peaks stretching to north and south, make the thirty-five mile trip well worth while, even if one may go no farther. Crossing the divide, the headwaters of the Siffleur (named for the whistling marmot of this region) greet the eye, and the traveler, behind his slowly moving pack animals, follows it for two days, till in its winding, wandering search, it meets and mingles its clear waters with the muddy, glaciated Saskatchewan.

The Saskatchewan Valley is in its way unique, a kingdom within itself. The Chinook winds of the Pacific, seeming to forget all intervening obstructions, plunge into this narrow space, and thereby govern the climate and many of the natural or physical conditions. Here are found flowers seen nowhere else in our mountain travel, the grasses grow tall and wonderfully luxuriant, horses thrive and fatten, and the Stoney Indians from Morley find it a most excellent health resort—deer, bear, goat and mountain sheep being most acceptable to the Indian constitution.

The valley ranges from three to eight miles in width and is

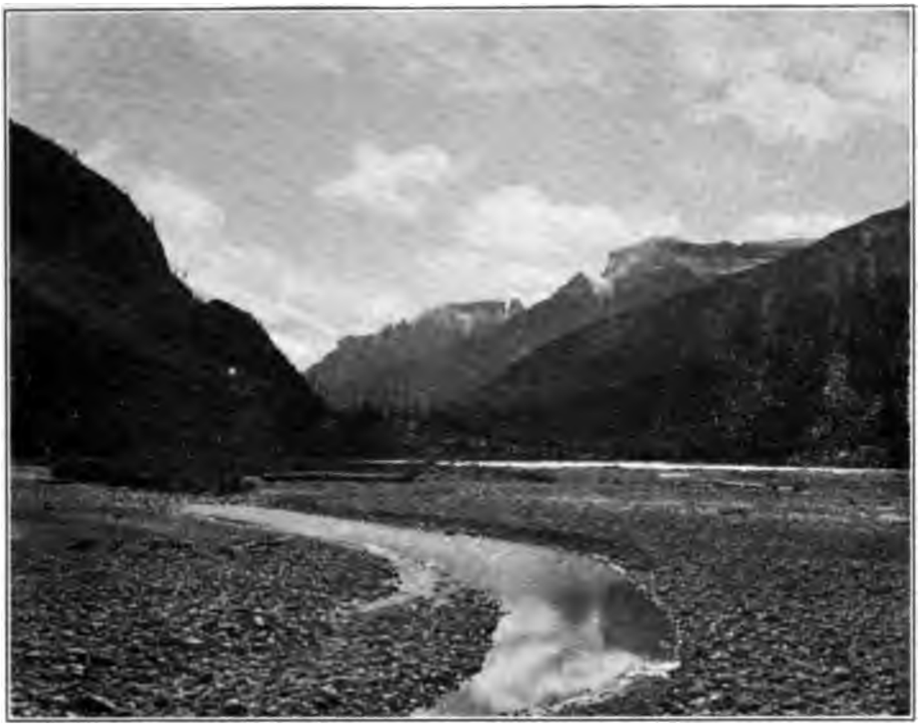

FIG. 2.—LOOKING SOUTH ON THE NORTH FORK OF SASKATCHEWAN RIVER.

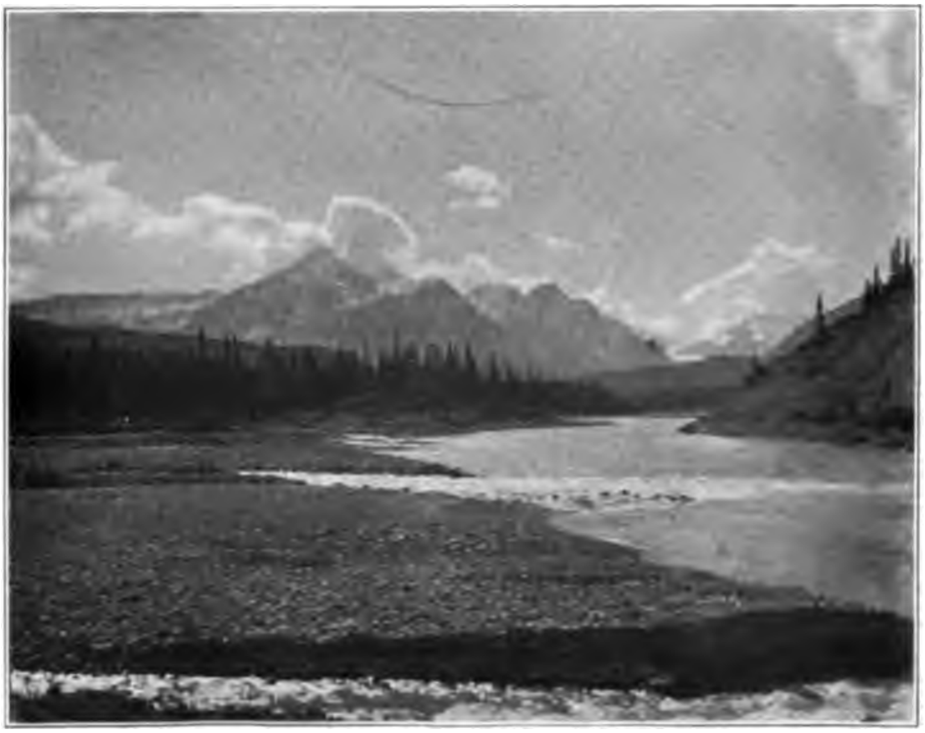

FIG. 3.—MT. FORBES AND LYALL ICE FIELDS FROM JUNCTION OF BEAR CREEK AND SASKATCHEWAN RIVER.

about eighty miles long. Its curious and charming characteristics were discovered about 1895 by one of the oldest established hunters of the country—Mr. Thomas Wilson—who has since built himself an ideal home there.

He was returning from the North Saskatchewan over the Pipe-Stone Pass with an exploring party when the autumn storms swept down upon him, and he was forced to abandon his horses, reaching Laggan as best he could. Returning in the spring to see if there was anything left of his animals, his surprise may be imagined when he found them fat and well and thoroughly enjoying life in this curious, warm, rich belt of the Saskatchewan.

Considering the lateness of the season in starting and the distance to be covered, the Wilcox Pass was our Mecca. Resting a few days at the Saskatchewan plains, testing the height and power of the waters of that strangely flowing, angry guardian to the northern highway, we found our horses quite equal to fording the now fast diminishing stream, and turned our faces westward to the junction of Bear Creek and the Saskatchewan, a matter of thirty miles.

Reaching this point, we found a never-to-be-forgotten panorama of a gathering of the monarchs of the hills. Mounts Murchison and Wilson, met but for the dividing waters of the Saskatchewan, Pyramid Peak, near Bow Summit, loomed clear and distinct upon the sky-line forty miles to the south, while Sarbach, Forbes, Survey Peak and the Lyall Glacier were ranged across the western horizon.

A day's side trip took us to Glacier Lake, an overflow from the vast Lyall ice fields. Fully five miles in length, green as an emerald, it lay in perfect peace among beautiful surroundings; the tall and stately spruces clung about its shores, while the vast ice tongues from the great Lyall Glacier, glistening in their purity, seemed slowly gliding to their doom in the cold, dark waters below.

But the days of the month were slipping rapidly by, the way was far to go, and provisions have a marvelous way of disappearing under such a strenuous life. The North Fork of the Saskatchewan greeted us with a superb cataract almost at its mouth, a little later the trail was badly marred with fallen timbers from an old forest fire, while near the headwaters was some of the most superb timber we had yet seen. The story of the Invader of Silence could be read in the ubiquitous tomato and condensed-milk cans seen at intervals on the trail, while here and there tent and tepee-poles marked a good camping ground. One writer of this region tells us that the Indians have some superstition regarding this valley and never visit it for hunting purposes. As old and new tepee-poles, triangularly placed fire-sticks, and well-cleaned goat and sheep bones were found in many desirable camping grounds, there seems some doubt about that statement.

Considering that fair days and warm sunshine had followed our little band for four weeks, one should naturally avoid much grumbling at Fate. Still it seemed hard lines to view the Wilcox Pass in a blanket of mist, to watch the little Sun Wapta, 500 feet below us, flowing to the far-away Athabasca, and apparently dissolving into a low-hanging cloud, to tread the summit of the pass and gaze not upon distant unknown mountain ranges, but on a white woolly blanket, which soon tossed snow and sleet in our faces and forced a retreat.

Leaving the summits to the grip of the coming winter, we retraced our steps to the junction of the North Fork and West Branch, with the merry sunshine mocking our way; and it was with a grain of comfort that we saw the sullen clouds still clustered on the heights as long as they remained in sight. Then down into our next home—Graveyard Camp, came the rain and sleet, an unpropitious omen for our first bit of exploring. At this point we were about to search out a trail directly east to Kline's Creek (an easterly tributary of the Saskatchewan) via Pinto Lake. To our small band of four this region was entirely unknown, and would be so to-day but for the pluck and determination of the guide-in-chief.

There is no record of any previous attempt to take horses and packs across this pass—Indians and a few white hunters alone having been tempted that way for goat and sheep. At the timber-limit stretched a fine park bordered with splendid spruces, while a large number of tepee-poles attested the fact that it was a favorite hunting ground for the fast disappearing red man.

The height at which the horses were eventually taken across was probably about 8,000 feet, being a mere goat-trail not over one foot wide in its most critical point, the rocks covered with a sheet of ice, and any small niche, which might have been useful for a foothold, filled with a dry powdery snow. Should any other aspirant

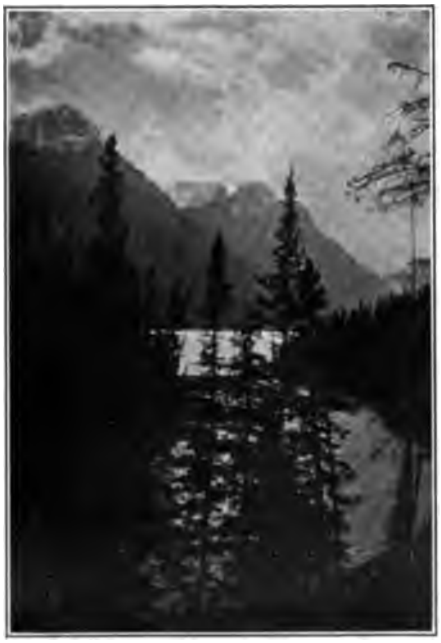

Fig. 4.—Glacier Lake.

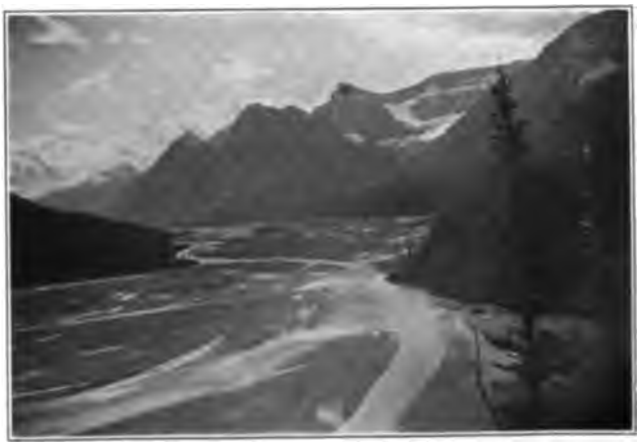

Fig. 5.—House Pass.

ever go that way, let him remember to bear to the left, or, like us, he will be stopped, at the moment he thinks he has reached success, by a wall of rock at least 1,000 feet high.

As we viewed Pinto Lake from that elevation, the sight well repaid us for all the cold and small hardships we had endured to get there. It is well named Pinto (meaning three colors), and is distinctly green, blue and purple. It is about three miles long and half as wide, stocked heavily with speckled trout, while over its surface flew hundreds of Diver-ducks.

Thanks to the skill of our good guides, even the heavily loaded horses reached the lower levels safely. Thus one by one do the fastnesses give up their secrets, and we realize that, with reasonable care, caution and good animals, one may travel almost anywhere in that great wilderness with perfect safety. Kline's Creek is probably named for a "fat, jolly old gentleman" whom Alexander Ross describes thus and speaks of meeting at Jasper House, a Northwest fur trading post in the early days. On the few crude maps to be obtained of that section it bears the name of Cataract Creek, but as there is no visible cataract in its whole length of forty miles, and as there is a very fine one in a small stream which flows into it near its junction with the Saskatchewan, it is undoubtedly one of those mistakes so easy to make in such an untraveled region.

Kline's Valley had little to show our now satiated eyes; forest fires, whether of Indian origin or not, had played havoc everywhere, and we were glad to escape from charred timbers to the golden meadows of the Saskatchewan Valley.

This valley is also called the Kootenai Plains, from its having been the meeting grounds of the Kootenai Indians of the Pacific and the fur-traders from Jasper House. The old, deeply trodden trails still mark the way—all that is left of the happy hunting days when beaver were plenty and even the buffalo found his way to the sheltering hills. Throughout Kline's Valley it was quite common to see the bleaching bones of these animals scattered along the trail, and also the well-defined paths made by these monarchs of the plains when seeking shelter from the wintry blasts among the thick spruces.

For us, too, the breath of the north would soon be blowing, the Stoney Indians were now gathering in large numbers near the spot on the Saskatchewan which we had called "home," and, though the glamour of the Indian will probably always remain with us to some extent, there is a too great friendliness about him which breeds a love of distance. He, however, retains much of the picturesque, and while we longed to use the camera indiscriminately he had an equal desire to possess our fast-diminishing store of bacon, and it seemed wise to hurry away to the south and to the land of bread and butter.

By October the Pipe-Stone Summit becomes inaccessible except on snowshoes, and then the Bow Pass—6,500 feet high—becomes most practicable. At its summit Bear Creek has its rise, while the well-known Bow River flows from its southern slope.

These two valleys are a fitting close to a summer's journey among the hills. Rivers, lakes, mountains and glaciers follow each other in a wild riot of glorious beauty, as though luring one to stay, then, grown petulant with the traveler's determination to still continue on his way, casts before his feet for twelve long weary miles a mass of the most trying fallen timbers.

Then comes the railroad into sight, a good hotel and prosy comforts—the summer's days have passed. The aromatic bough beds, our loved horses, the evening camp-fires, the twinkling stars by night, the bright sunshine by day, the soft sweet balsam-laden air are behind us: the roar of a great city comes to me as I write—it seems but a dream.

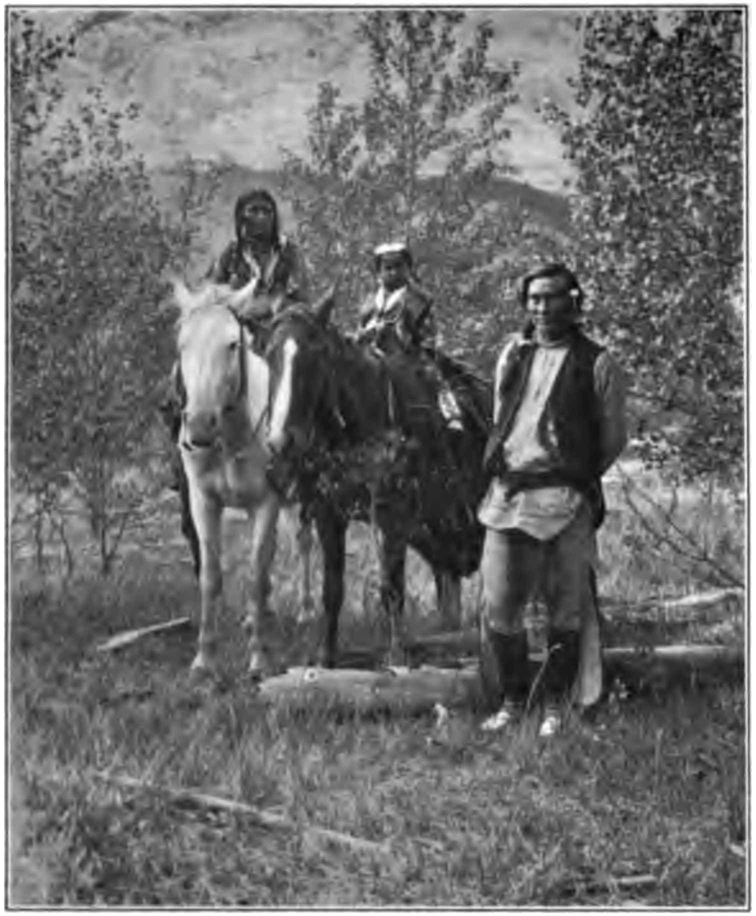

Fig. 6.—A Stoney Indian Family.

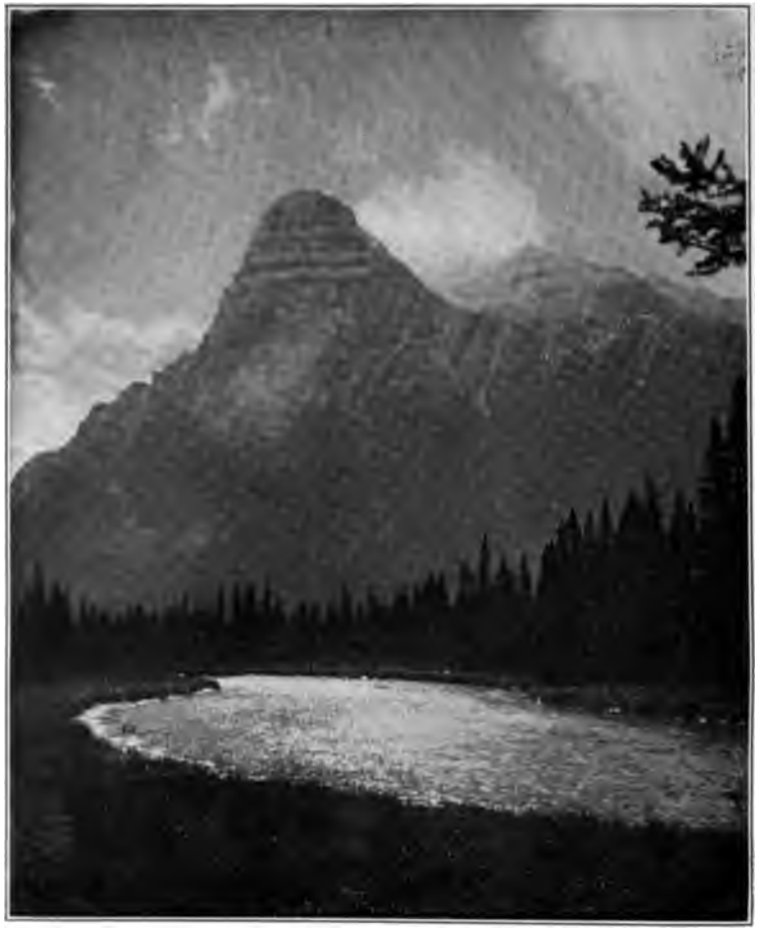

Fig. 7.—Pyramid Peak and Bear Creek, Forty Miles North of Laggan.

OBITUARY

In the death of Mr. Bernard L. Douredoure the Society has lost one of its most earnest and devoted members. Although it was known that Mr. Douredoure was not enjoying his usual health, the announcement of his decease on February 16th came as a shock and a surprise to his many friends.

His membership dates back to the early days of the Society, and in January, 1900, he was enrolled as one of the life members. His personal integrity, good judgment and deep interest in the Geographical Society made him at all times a valuable advisor. His unostentatious generosity was exemplified in many ways and on various occasions. The book plate used in the volumes of the library was one of his gifts, and almost his last visit to the rooms of the Society was for the purpose of making an unsolicited contribution for the purchase of books. A tasteful leather portfolio containing the records of the International Congress at Paris in 1900 remains as a memento of Mr. Douredoure's services as delegate on that occasion. Though always ready to overlook the shortcomings of others, his own rule of life was strict and almost severe. So scrupulously conscientious were all his acts that it was only after much persuasion that he consented to assume the duties of a Director. Had not death deprived the Society of his wise counsels, his second term as a member of the Board would have continued until May, 1908.

ACTIVITIES OF THE SOCIETY

THE CONQUEST OF MOUNT McKINLEY

ADDRESS BY

DR. FREDERICK A. COOK

At the Stated Meeting, January 2, 1907.

Dr. Frederick A. Cook recounted his experience in the conquest of Mount McKinley. Mount McKinley, believed to be the highest point on the North American Continent, difficult of access and still more difficult of ascent, has long been the objective point of many an ardent American mountaineer. No one has been more active than has Dr. Cook in this siege of the unscaled peak. Unsuccessful in a previous attempt, he returned to the attack in the summer of 1906. Again, almost ready to admit defeat and return to civilization, Dr. Cook and a single companion, by chance, found the way to the summit open before them. In the face of the rapidly approaching winter, with none too plentiful supplies, they pushed rapidly on, realizing that even a delay of a single day might mean having to abandon the attempt and almost certain victory until the following year. After several days of hard work, their persistency was rewarded in gaining the topmost point of the main crest.

Dr. Cook gave many interesting phases of the explorer's task, and especially of the difficulties besetting the path through regions of snow and ice, of muskegs and torrential streams. A large number of stereopticon illustrations supplemented the descriptions. A number of the views were of the previously undiscovered country, while others showed the beauties and grandeur of the Alaskan scenery.

Dr. Cook's successful ascent of Mount McKinley is interesting not merely as an achievement in mountaineering. Of still greater importance is the new information obtained about the geography of this Alaskan region, much of which is not yet in a form for giving to the general public.

ANNUAL DINNER OF THE GEOGRAPHICAL SOCIETY.

January 25, 1907.

Contrary to the usual custom the annual dinner of the society was held at Hotel Walton on January 25, instead of later in the spring as formerly. The wisdom of the Executive and Entertainment Committees was evident in the result—the most successful and most largely attended dinner in the history of the society. Last year some 120 members and guests attended, while this year 193 took advantage of the opportunity to join in the reunion and at the same time to meet the distinguished guests of the society.

Professor Emory R. Johnson, president of the society, presided at the tables where were seated the guests of honor, and also acted as toastmaster. He said in part "We have come together in reunion to-night in order that we might become better acquainted with each other and with the distinguished geographers who are our guests on this occasion. The efficient chairman of our Entertainment Committee has wisely interpreted geography as including the world and the various people who live therein.

"This is the largest reunion we have ever had and it is an indication that our society is making headway. Year by year we grow in numbers and in *esprit de corps*. Of course we know, and are willing to confess among ourselves, that we are yet only getting started. When some one of our many generous friends is moved to present us with a home, such as our sister societies in New York and Washington have, and some other equally magnanimous patron is constrained to endow the library and the publications of our society, and when five figures instead of three—an eight and two ciphers—are required to state the numbers of our members, then we may really feel that we have got under headway. Philadelphia is supposed—erroneously, we think, of course—to start slowly; but bodies that start slowly often gather momentum with their progress, and in time become irresistible."

Commander Robert E. Peary responded to the first toast, "The Peary Arctic Club." In introducing the speaker President Johnson said: "A reunion of this society seems very incomplete unless Commander and Mrs. Peary are with us; and I am glad to say that they are seldom absent, except when he is away on one of his frequent polar hunts. The pole has a fascination for him—the fascination seems to have become an enchantment. We all hope he may win the prize he has so long sought; that he may have the honor and the high satisfaction of being the first to reach the pole, and with the stars and stripes in hand."

Commander Peary spoke briefly of the organization and working of the Peary Arctic Club, with Mr. Morris K. Jesup as one of its most active spirits. He described briefly the features of his recent "dash," in which he reached "farthest north." And then he referred to the possibilities of the future in regard to polar explorations. As Commander Peary expressed it, "the time is now ripe" for the actual winning of the North Pole. Also, in the light of present conditions, benefitting by the knowledge from experiences, American explorers can do more in the Antarctic "in one year than has been done by others in ten years." In his opinion it is an American duty to carry out these explorations, that the present time is in a way the pyschological moment, and that through the almost certain success will come much national prestige.

Another Arctic explorer of quite a different type, however, Dr. Wilfred Grenfell, responded to the toast "Life in Labrador." In introducing him the toastmaster said, "If I were asked to name the most salient characteristic of the present age, I would confidentially say that it is the growing spirit of altruism. Not everybody is good, but there is some good in everybody, and some persons are altogether good. Dr. Grenfell seems to belong to the class of the altogether good. I have given some slight study to the life and work of Dr. Grenfell, and as near as I can discover, he is a doctor, a sailor and a pastor—a rather unusual trinity. Lord Strathcona is reported recently to have said 'If I were asked to name the most useful man on the North American continent, the man who nearest approaches the heroic ideal, I think I should name Dr. Grenfell.'"

Dr. Greenfell in answering to this toast spoke very earnestly and interestingly of his work in Labrador—his hospitals and stores and his efforts in trying to uplift and better the conditions of the natives. Dr. Grenfell gave a very interesting lecture before the society at its regular meeting on February 6—a brief summary of which is printed in this issue of the Bulletin, and which gives some idea of the conditions of life in Labrador.

Other speakers of the evening and their toasts were Mr. Cyrus C, Adams, "The Association of American Geographers;" Professor William Libbey, "Reminiscences of Palestine;" Hon. William Potter, "Memories of Italy;" and Mr. Gilbert H. Grosvenor, who in the absence of Dr. Alexander Graham Bell, spoke of Dr. Bell's experiments in aerial navigation.

The guests of the society were Commander Robert E. Peary, U. S. N., Mrs. Robert E. Peary, Dr. Wilfred Grenfell, Hon. William Potter, Dr. Frederick A. Cook, Mrs. Frederick A. Cook, Mr. Cyrus C. Adams, Professor William Libbey, Mrs. Leonidas Hubbard, Mr. Herbert L. Bridgman, Mr. J. S. W. Holton, Mrs. J. S. W. Holton, Mr. Gilbert H. Grosvenor, Mrs. Gilbert H. Grosvenor, Rev. Carl E. Grammer, S. T. D., Mrs. Carl E. Grammer, Mr. George W. Ochs.

The entertainment committee was under the direction of Miss Laura Bell, chairman.

LIFE IN LABRADOR

ADDRESS BY

DR. WILFRED GRENFELL

At the Stated Meeting, February 6, 1907.

Dr. Wilfred Grenfell addressed the society on "Life in Labrador." Dr. Grenfell's work in Labrador is that of a practical missionary—the earnest endeavors of an unselfish man living his life almost wholly for the benefit of those who need material help in the betterment of their condition.

Labrador is not an especially inviting place to live one's life, yet a whole decade of Mr. Grenfell's life has already been spent in this devotion to the natives. During these years hospital stations have been established, a hospital ship has been acquired, so that he can travel readily from one point to another, visiting the different parts of the coast and dispensing the medical attendance which has been sorely needed. Stores have been started at different points, at which pure food supplies and provisions are sold to the natives at moderate prices, his plan being but a part of the war against disease from which the natives have suffered so severely in times past because of poor, improper and often insufficient nourishment. Much has already been accomplished by this eminently practical form of missionary work, and Dr. Grenfell hopes to accomplish much more as time goes on.

Reindeer have been introduced into the settlements, with fairly good success up to the present time, while the general occupations and resources of the people have been improved wherever practicable. In fact Dr. Grenfell's whole method shows much wise foresight in his plan to elevate the unfortunate native—formerly disease-ridden, poorly fed fishermen. First, make him well and attend to his physical needs, then begin to educate him in better ways of living, seems to have been Dr. Grenfell's maxim. Its efficiency is well supported by the evidence of progress and the loyalty of the native to their benefactor.

It is interesting to note that the carrying on of the work calls for an expenditure of not less than $25,000 a year, much of which is raised through Dr. Grenfell's own endeavors. Such a work in the hands of a man of this heroic type deserves all the best support and success possible.

INTERMONTHLY MEETING.

February 20, 1907.

"Jamaica and the Kingston Earthquake" was the timely subject for this first, and very successful, inter-monthly meeting of the year. Mr. Anthony W. Robinson and Dr. Theodore Le Boutillier exhibited a large number of views illustrative of conditions in Jamaica and in Kingston previous to the earthquake.

The rest of the evening was devoted to a description of the Kingston disaster by Miss Helen C. Bennett, who was in the city at the time the earthquake occurred. A somewhat revised and enlarged account of the earthquake, written by Miss Bennett, appears in this number of the Bulletin.

A PILGRIMAGE IN GREECE

ADDRESS BY

DR. H. H. POWERS

At the Stated Meeting, March 6, 1907.

"A Pligrimage in Greece" by Dr. H. H. Powers, head of the University Bureau of Travel. No one could be better fitted to give a thorough appreciation of Greece and what Greece has stood for in the world, than is Dr. Powers. Speaking of a country which he loves, of a country and of places grown familiar in his many visits, Greece itself and the remains of ancient Greece could hardly help but mean far more to him than they do to the casual observer.

Beginning with Sicily, once Greek in character as much as was Greece itself, and travelling by way of Crete to the Grecian peninsular, Dr. Powers' description followed a journey covering the most attractive points in the ancient Greek world. Mycene, Delphi, Olympus, Athens, Delos, the birthplace of Apollo, were some of the places on which Dr. Powers dwelt with interesting emphasis. Many excellent illustrations supplemented the speaker's interpretation of these places of the past.

Perhaps the most interesting of all Greek institutions are the famous temples of Olympus, and the oracle at Delphi. Olympus with its temple gives a "Synopsis of all Greek Art"—since in it were put pillars replacing fallen ones—not of the style of the former art, but of the art then prevalent. Olympus with its games stood for the Greek spirit—faithfulness in training, honesty and fairness in play, glory alone in victory, credit in honorable defeat.

Delphi, the all-wise oracle, was a fruitful theme for Dr. Powers' interpretation. At this crossing of mountain trails was a wonderful spring and a cave from which issued gases of supposedly magic power. What more natural than the oracle of Delphi should become far famed. What more easy than that the oracle might become familiar with the affairs of many states, from the coming and going of travellers from afar. But the oracle failed, and failing once its prestige was lost. Of this place only ruins and the mountain trails remain.

So with much of Greece. Ruins,—silent witnesses of huge projects,—structures wonderful in their bigness,—art which has never been rivalled—coming to us through long centuries—such is Greece.

THE ASCENT OF IXTACCIHUATL.

Ixtaccihautl, the lofty volcanic and glacier-covered mountain of Mexico has been conquered by Mr. Charles Gilchrist, a member of this society. The ascent has been attempted by but few people. It affords a test of endurance and the enthusiastic climber is exposed to no little danger. According to the meagre reports so far received, Mr. Gilchrist had twice to abandon his attack on the summit when within 500 feet of the coveted goal. The third and successful effort was made after spending several days on the mountain.

As soon as the announcement of his ascent appeared in the daily papers an endeavor was made to have Mr. Gilchrist relate his experiences at the March Intermonthly Meeting. This proved to be impracticable as the meeting occurred before he expected to return to Philadelphia. A letter received since states that he will be pleased to address the society at some future meeting, when an opportunity will have been given for the preparation of lantern slides from the photographs taken.

BOOK DEPARTMENT

NOTES.

Abhedananda, Swami. *India and Her People.* Pp. 285. Published by the Vedanta Society, New York, 1906.

This book embodies a course of six lectures delivered before the Brooklyn Institute of Arts and Sciences, with an additional lecture on "Woman's Place in Hindu Religion." The topics discussed are philosophy and religion, the social, political and educational conditions in India and the comparative influences of Eastern and Western civilization. The volume is dedicated "To the People of India with deep fellow-feeling and earnest prayers for the restoration of their ancient glory and national freedom."

Swami Abhedananda is well versed in the various branches of Hindu lore; he explains clearly and tersely the systems by which the people of India have lived and been governed all these centuries, and traces back to the Hindus almost every known form of science and religion subsequently introduced by Greek or Roman to the more modern world. With a narrowness to be regretted in so able a writer, he allows no good things to come out of Nazareth," so to speak. He is eloquent in denouncing the advent and extent of British rule and missionary endeavor, upholding in every point the Hindu method of life and thought, and acknowledges but one good act during the administration of the last viceroy, namely, a permanent grant of £220,000 for primary education. He does admit the great need for free education and also the indebtedness to Great Britain for introducing English instruction in India. With that exception, the whole volume is stamped throughout with firm adherence to Hinduism and the hope that Hindu leaders may assimilate whatever good they may perchance find in Western ideals, and reorganize their own nation so that it may stand as a power among others.

This is to come mainly through the system of Vedanta, which embraces both philosophy and religion, and has the largest following at the present time.

L. B.

Belloc, H. *Esto Perpetua.* Pp. 192. Algerian Studies and Impressions. Duckworth & Co., London. 1906.

This little book makes a most charming introduction to the southern Mediterranean shore and to the mountains and table-lands to the north of the Sahara. With it one approaches the island-like coast, acquaints oneself with the many boats with their tall lateen sail acquired from the Arabs, and lands upon the shore where ancient cities and high, steep cliffs abound.

The great charm of the book—and it has a real charm—lies in the atmosphere which it suggests. One learns what Roman conquest meant in all that northern land and how, unlike the modern French, it reached its "Thus far" on the edge of the great desert. The reader travels with the author and at some turn of the road is startled by the sight of a massive stone archway; along some barren stretch of land a great aqueduct is seen; Roman walls and roads, coliseums and statues, and ruined cities attest that ancient power, every stone of whose decay still shows forth strength. Ancient Constantine, that great city, and its Rock of Cirta impress one's imagination. One wanders through ancient Timgad, conscious of the feeling of awe at its loneliness amongst the monuments of its great past. One appreciates the spirit of the book's title—"Esto Perpetua"—surely though Rome lies conquered one says "You shall not die."

The book claims one's interest. Readers might differ regarding the question of European domination, set forth so strongly and the contrast of the Roman and Mohamedan faiths. The sketches add much charm to the narrative and the little maps locate one absolutely.

MARY S. HOLMES.

Forbes-Lindsay, C. H. *Panama. The Isthmus and the Canal.* Pp. 369. The John C Winston Company, Philadelphia, 1906.

That a book on the Panama Canal is timely goes without question, since the canal construction is not only incomparably the most gigantic engineering project in the history of the world, but its completion will inaugurate a readjustment of national and international commercial relations.

The first part of the book is a historical resumé of the early explorations of the isthmus; the time and location of the first overland routes; the inception of the canal idea in the sixteenth century; and the attention it received during the three succeeding centuries at the hands of the Spanish, British and French respectively. Then follows an accurate and interesting narrative of the various negotiations, treaties, and surveys by the United States Government, or its accredited representatives.

The appendix gives valuable information as to the construction, operation and returns of the great canals of the world.

In its historical and observational features the book is strong, both in narrative and arrangement; but the detached portions which deal with the economic and commercial significance of the canal are manifestly weak, yet this is the phase of the study which would appeal to the average American reader most. The author dismisses the economic discussion by referring the reader to the voluminous reports of the Isthmian Canal Commission, which, like all special governmental reports, have a comparatively limited circulation.

G. T. S.

Genther, Dr. Siegfried. *Korea.* Pp. 343. Edited by Dr. Georg Wegener. Allgemeiner verein für Deutsche Literatur, Berlin.

Korea, a book of travels, written in German by Dr. Siegfried Genther, and edited by his friend Dr. Georg Wegener, appeared originally in 1901-1902 as a series of articles in the "Kölnische Zeitung," for which newspaper Dr. Genther was the foreign correspondent. According to the custom of the management these articles were printed unsigned, but after Dr. Genther's tragic death in Morocco in 1903, where he was murdered by some natives in the outskirts of Fez, his Korean correspondence, with the consent of the editors, was collected and is presented to the public in its present enduring form. Landing at Chemulpo the young journalist crossed the Korean peninsular obliquely from west to east, stopping on the way at some Buddhist Monasteries in the mountains, his account of which is full of novel interest. His description of Seoul, which, when translated means "The Chief City," is as illuminating as the electrical appliances with which the capital abounds, in strange contrast to the otherwise semi-barbaric conditions that prevail. The concluding chapters tell of a venturesome visit to the Island of Quelparte in the Yellow Sea.

Dr. Genther's wide experience as a traveller, although he died at the early age of thirty-three, combined with his brilliant journalistic ability gives this book a distinct value to lovers of untravelled routes. It is hoped that the promised production of his experiences in Morocco, published under the same conditions, may come under an article at a later date.

EMILY BELL.

Giffen, J. Kelly, D.D. *The Egyptian Sudan.* Pp. 252. New York, Fleming H. Revell Co., 1905.

The account of the Sudan by Dr. Giffen contains a brief resumé of the history of that comparatively unknown region and an interesting narrative of his journey from Assuan, up the Nile, over the desert to Omdurman, Khartum and beyond to the land of the Shullas upon the Sobat River, a tributary of the White Nile. The incidents of the journey and the life of the native people portray a very primitive condition, and Dr. Giffen's work as a missionary is quite suggestive.

The book is brief and interesting, and gives quite an insight into the region depicted.

M. S. H.

Havell, E. B. *Benares, the Sacred City.* Pp. 226. Blackie & Son, London, 1906.

For one who would take up the study of a religion which governs the lines of an enormous number of people, this book will give a most interesting and pleasantly written account of the Hindu religion and with the special outgrowth known as Buddhism. As the author tersely states "It is because Benares is not forbidden, that such a mine of human interest, and one of the most extraordinary cities of the East, is now probably less known to most Europeans than Lhasa."

Beginning with a supposed date of 1,400 to 1,000 years B. C. and the advent of the Aryans into a section of India near Benares, bringing with them a religion composed entirely of Nature worship, Mr. Havell has woven an interesting account of the growth of Hinduism, the coming of Buddha about 557 B. C., his life of humility and simple teachings among the masses and the popular superstitions which invested his person with miraculous powers after his death. The systematic explorations recently of archaeologists about

Sarnath are beginning to light the remarkable history of this wonderfully humble, good and religious man. From a history of the births of the various religions thus sprung from Hinduism, the book carries the reader on through the streets of the Benares of to-day. Among the shrines, the thousands of motley pilgrims, the profound worshipers on all sides, the brass and copper workers, the beautiful dancing girls, the curious traveller wends his way—a mere on-looker where he could never be a part. Charming word sketches are intermingled with delightfully well executed photographs, and on closing the book, the reviewer, who had started to read from a sense of duty ended by wishing her grip was packed—then away to Benares before it is quite ruined by the inevitable sight-seer.

MRS. CHAS. SCHÄFFER.

Hulbert, Homer B., F.R.G.S. *The Passing of Korea.* Pp. 473. Doubleday, Page & Co., New York, 1906.

The author of The Passing of Korea has studied the life and conditions of the Koreans intimately and has presented the strength and the weakness of the nation from every point of view. He carries his reader along with an unwavering interest as he reviews the geography, legends, history, art, literature and industrial conditions of Korea, to prepare him for the presentation of his ultimate aim, which is to bring the American nation to recognize its duty in Korea.

In the Japanese war, Japan promised in 1904 to preserve the independence of Korea, but in 1905 the Emperor of Korea saw that the real Japanese intention was to assume a protectorate and that Korea would lose her independence.

The first clause of the treaty of 1883 between Korea and the United States says, "That if either of the contracting parties is injured by a third party the other shall interfere with her good offices to effect an amicable settlement."

The author reminds the American nation that it was the first Western power to make a treaty with Korea, and that it guaranteed to keep a watchful eye upon her safety and interests. He claims we have not done this, and to prove our professions of friendship believes it is a duty now to put forth efforts for the elevation and moral condition of the people, and appeals for the establishment of an institution of learning in Seoul which shall be the nucleus of a great national movement. He believes there is no place where money can be invested in education that will bring larger or more beneficient results.

The book is full of interest and information.

MAUDE G. HOPKINS.

Landor, A. Henry Savage. *Tibet and Nepal.* 233 pages with sketch map. A. & C. Black, London, 1905.

The author of this beautifully illustrated book had figured previously in an attempt to reach the sacred city of Lhasa, but being captured he later managed to escape with the loss of one eye. Not content with his former rough experiences, he set out to explore the more inaccessible parts of the Himalayas in Tibet and Nepal. He ascended one of the Lumpa peaks to the great elevation of 23,490 feet, thus breaking the world's record for the ascent of high mountains. Mr. Landor gives in a very readable style his impressions of the Tibetan races encountered, their customs, religious rites, superstitions and manner of dress. The account of some of his hair-breadth escapes in mountain climbing are narrated in a Baron Munchausen style and with the skill of a trained limner are depicted in several of the colored illustrations, which copiously adorn the book. The work gives in a chatty way many important facts about a little known region.

Libby, Wm., and Hoskins, F. E. *The Jordan Valley and Petra.* Vol. II. Pp. 380. G. P. Putnam's Sons, New York, 1906.

This volume describes the journey from Kerak to Petra and Mt. Hor, and the return to Jerusalem. An appendix contains notes by Gilbert Van Ingen on the fossils collected.

Leaving Kerak, and observing the ruins of thirty towns and villages in the first four hours' ride, five days travel, passing incidentally Shobek, the Mons Regalis of the Crusades, brought the authors to Petra.

Apart from descriptions of Mount Hor, Aaron's tomb, now a Moslem shrine, and the Dead Sea, the volume is mainly devoted to Petra—ancient, solitary, mysterious, beautiful, in many particulars the most remarkable spot in the world,—"A rose-red city, half as old as time."

In the midst of a mass of castellated peaks of indescribable colors the site of the city is a basin surrounded by a rampart of mountains, through which extends the Sik, a gorge a mile and a half long and from twelve to forty feet wide, between walls several hundred feet high.

Within the city, temples, tombs, and excavations of vast numbers are cut in the encompassing cliff like walls, the cliff faces being fashioned into columns of facades. The sandstone formation is brilliantly tinted in a variety of colors which change like the hues of watered silk. "Pharaoh's Treasury" is said to be one of the largest, most perfect, and most beautiful monuments of antiquity. The Deir, or Monastery, is 151 feet wide and 142 feet high, and impressive in size. While the floor of the main depression is occupied by masses of ruins, there are in the open a theatre having a seating capacity of 5,000 and several "High Places" with their accessories of worship.

This volume like the first is copiously illustrated, ten views being given of the Mosaic map of Madeba alone.

F. NORMAN DIXON.

McKie, Thomas. *Summer Rambles.* Pp. 475. Edinburgh, David Douglas 1906.

It has been said of Rome that "The memory sees more than the mind" and it occurs to the reader of "Summer Rambles" that the author's memories of journeys here and there through Great Britain, with just a peep at Germany, must have been delightful ones.

Many remote corners are visited especially in Ireland and Wales;

many a legend and anecdote related. Facts—and necessarily not new ones—there are, recorded of old and much-written of countries, but historical events and literary notes are so interspersed with bright comment, that one scarcely realizes that accurate information is being imparted.

A keen appreciation of natural scenery pervades these sketches. Perhaps "Ben Nevis" from a scenic standpoint is the most charming chapter. But, indeed, all of the author's pen-pictures are sufficiently alluring to make the reader desire to visit in his own proper person each place described. If he cannot do this a very pleasing way of covering the same ground may be found through the medium of this little book.

RACHAEL P. BARKER.

Sierra, Licentiate Justus, and Ballesca, James. *Mexico.* Its social evolution, synthesis of the political history, administration, military organization and economical state of the Mexican Confederation, its advancement in the intellectual sphere, its territorial structure, growth of its population, means of communication both national and international, its achievements in the field of industry, agriculture, mining, commerce, etc., etc. Monumental inventory summing up in masterly expositions the great progress of the nation in the XIX century. Mexico quarto Tome I, 1900; Tome II, 1904.

The scope of this work in two Tomes (Tome I, volumes 1 and 2, Tome II) is described in the above citation of the title page. The literary editor Justus Sierra and the artistic editor James Ballesca have been assisted in their labors by thirteen literary men, who have contributed to the success of a work which will always remain a mine of information upon the geography, government and people of the neighboring republic. The volumes are embellished with beautiful colored plates and half-tone reproductions of Mexican scenery, buildings and public men. The contents of the three volumes are so rich and varied that the reviewer finds it impossible to make a condensed statement without sacrificing much of importance and value. Those sufficiently interested can in lieu of such an account consult the pages of the work itself which has been done into English from the original Spanish by G. Sentiñon and printed by J. Ballesca & Co., Mexico.

JOHN W. HARSHBERGER.

Jacob, Robert V. *A Trip to the Orient.* The story of a Mediterranean Cruise. Illustrated. The John C. Winston Co., Philadelphia, 1906.

The author of this volume has preserved the records of a pleasure cruise from New York to the Orient, made in company with other tourists who filled the steamer Moltke, and were conducted through the Mediterranean, stopping at all interesting ports and making side trips into the country. In this way, Madeira, Gibraltar, Spain, Algiers, Malta, Greece, Turkey, the Holy Land, Egypt and Italy were visited, and the writer returned from the newer attractions of Nice and Monte Carlo with many vivid memories of foreign countries and customs. At the request of his fellow-travelers he has compiled the volume first issued, which will serve as a comprehensive diary for those in the party, and will be of interest and use to future voyagers to the same places. Mr. Jacob has made careful note and observations of historical facts and scenes, as well as of the general characteristics of the landscape. He is fortunate in having the work profusely illustrated with pictures taken by members of the party.

Bourne, Annie Nettleton. *The Voyages and Explorations of Samuel de Champlain* (1604-1616). Narrated by himself, translated by Annie Nettleton Bourne, together with voyage of 1603 reprinted from Purchas His Pilgrimes, edited with introduction and notes by Edward Gaylor Bourne. Two volumes, A. S. Barnes and Company, New York, 1906.

These two attractive little volumes form part of the *Trailmaker's Series,* which has already given us in popular form the narrative of a number of the early explorers of America. Champlain's account of his explorations makes a particularly fitting contribution to the series. The great Frenchman was not only the first to make a detailed exploration of the coast of New England and Nova Scotia, thus affording us the earliest information on the Indians of these regions, but he laid the foundation of New France. "He stands forth as perhaps the ablest of the earlier makers of America, a leader of indefatigable energy and sterling character, a Frenchman who devoted his life to extending the name and power of France and the civilizing influence of the Church."

The most serious effort that had been made to bring Champlain's work before the reader in English was by the Prince Society, which some years ago (1878) published a careful translation by Professor Otis, of all of his narratives of explorations on the New England coast, in New York and Canada, down to 1617. But the edition was strictly limited. Champlain's account of his voyages therefore still remained a closed book to the general reader. This need the present work adequately supplies.

There is no attempt in these volumes at a complete edition of all Champlain's writings on his explorations, with notes and critical apparatus. Instead we have a good translation of that portion of the final edition published in 1632, of his works, which deals with his explorations. In this edition, which Champlain has dedicated to Cardinal Richelieu, Champlain has made many revisions, and he appears quite as much the historian of the first French discoveries and colonization, as the narrator of his own activities as an explorer. There are, in addition to the narrative itself, which often varies greatly from the earlier edition, numerous corrections, explanatory comment and a good deal of criticism and suggestion on French colonial policy. The claim that this edition of 1632 is not a second edition of Champlain's early work but simply an abridgement, Professor Bourne rightly discredits, notwithstanding its summary treatment of the 1603 voyage.

To the student of Geography the author's account of the extent of New France, the excellence of its soil, its rivers, lakes, ponds, woods, meadows and islands will be of especial interest. Here is a bit from Vol. I, p. 3: "It must be said also that the country of New France is a new world, and not a kingdom; perfectly beautiful, with very convenient locations, both on the banks of the great river St. Lawrence (the ornament of the country) and on other rivers, lakes, ponds and brooks. It has, too, an infinite number of beautiful islands, and they contain very pleasant and delightful meadows and groves where, during the spring and the summer, may be seen a great number of birds which come there in their time and season. The soil is very fertile for all kinds of grain; the pasturage is abundant; and a network of great rivers and lakes, which are like seas lying across the countries. * * *

"In New France there are a great many savage peoples; some of whom are sedentary, fond of cultivating the soil, and having cities and villages enclosed with palisades; others are roving tribes which live by hunting and fishing, and have no knowledge of God. * * * *

"And there are other kinds of birds of prey, less common than those named, with grey plumage on the back and white on the belly, as fat and large as a hen, with one foot like the talon of a bird of prey, with which it catches fish; the other like that of a duck. The latter serves for swimming in the water when he dives for fish." * * * *

The same habit of careful observations appears in his account of the customs of the Indians, how they made birch bark canoes, revived those who faint away, cultivate the Indian corn, received strangers, danced in acknowledgement of gifts of beads and knives, etc.

The translator has done her work admirably, preserving the simplicity and charm of the original to an unusual degree. The notes by the editor with those incorporated from Laverdière and Slafter are suggestive and very useful. Included in the introduction is a brief but well written life of the great explorer.

WM. E. LINGELBACH.

Miller, W. *Greek Life in Town and Country.* G. P. Putnam's Sons, New York, 1906.

This book is especially to be recommended to those intending to travel through Greece and reside for a while in its different cities.

The author takes one right in with himself to the inmost life of the people. You are shown how proud the Greeks are of their Hellenic descent through all the vicissitudes of two thousand years. One is amused at some of their personal characteristics, notably that of asking innumerable questions of each traveller about himself, which custom they regard as merely a display of polite interest. The author dilates upon their generous hospitality, and the total absence of class distinctions. He also gives a fine description of the government and its workings, while at the same time severely condemning the "spoils system" and the giving of favors, claiming that politics enter almost every phase of Greek life. He has also a good account of the members of the royal family, their habits and individual characteristics.

He shows a most intimate knowledge of the religions of Greece, the churches, monasteries, fast-days and holidays. He takes one into the homes with his descriptions of several different kinds of weddings, of betrothal customs, funerals, baptisms, ceremonies of Christmas and New

Years. He makes one appreciate the vendetta as it is at present in some districts, and explains how the belief in the "evil eye" still prevails.

He gives a novel account of Greek newspapers, and claims that the latest editions take precedence of every other kind of reading, and that they are most eagerly looked for by city people, country folk, the army, the navy and the church; and that everybody is completely absorbed in the political news. The system of education is well explained and one obtains a fair idea of the schools and teachers, the position of the majority of teachers being subject to political favor. He also gives a good sketch of preparations for, and conditions of army and navy life and of the administration of justice and of the courts of Greece.

The book is illustrated with fine pictures showing many styles of architecture. One peculiarity in regard to the buildings is that they all seem to be surrounded by a great expanse of lands which makes a strong background and emphasizes the beauties of the architecture.

The book is not like an ordinary guide book. His information is very comprehensive and could only have been collected by one living in the land. The style of writing is more that of a lecturer addressing an audience, the expressions are occasionally colloquial, and he makes one feel that he is telling his great experiences of Greek life in town and country.

MRS. ALDEN H. WEED.

Merzbacher, Gottfried. *The Central Tian-Shan Mountains.* Pp. 285, with illustrations and map. John Murray, London, 1905.

This is a report, published under the authority of the Royal Geographical Society, of Dr. Merzbacher's expedition in 1902 and 1903 to the mountainous southern border region of the Russian and Chinese Empires. Accompanied by a geologist and an engineer, with two Tyrolean guides and whatever porterage assistance could be obtained from natives, the author extended his exploration aside from the course of previous expeditions. As a result he brought back observations and surveys, thoroughly Teutonic in their thoroughness, which, when brought together, will materially modify existing maps. With its exceptional illustrations, the present volume and to a greater extent, the detailed records of which it is but a summary, should prove a valuable contribution to the rather limited scientific knowledge of this part of the Asiatic Highland.

B. R. H.

Wharton, Anna Hollingsworth. *Italian Days and Ways.* J. B. Lippincott Co., 1906.

A number of interesting letters by a well-known Philadelphia writer, recounting to a friend in America the joys as well as the discomforts of three lone women who spend four months going the usual round of Italian cities and towns so attractive to tourists.

The letters soon make the reader acquainted with Zelphine, Angela and the writer of the letters, Margaret. The usual number of Americans meet by the way, and two Italian gentlemen, attracted by the charming face and blonde hair of the youngest member of the party, shower favors on the trio, making their stay in the cities gay with social attractions and keeping up a rather weak romance that only ends with the last page of the book.

By far the best letters are those from Rome in which the Gregorian ceremonial held in St. Peter's in Easter week, when fifty thousand people attend to hear the Pope celebrate Mass at the high altar is well described.

The ride from Paestum although free from the brigands of past days was most exciting owing to the effect of the mild Italian wines on their vetturino.

The quotations and good photographs add much to the attractiveness of the whole, making a pleasant and readable book.

S. M. B.

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AFRICA.

ALGIERS .... CROUSE

Algiers. By. M. Elizabeth Crouse. New York: Jas. Pott & Co., 1906. Illustrations. *Presented by the Publishers. To be Reviewed.*

WEST AFRICA .... DELEVOYE

Enseigne de Vaisseau Delevoye, Second de la Mission Lenfant. (1903-1904. En Afrique Centrale (Niger-Bénoué-Tchad). Lettre-Preface de M. Lucien Hubert. Paris: H. Le Soudier, 1906. Illustrations and Map. *Presented by the Publishers. To be Reviewed.*

AMERICA—NORTH AND CENTRAL.

BRITISH COLUMBIA—MINING .... LOW

Preliminary Report on the Rossland, B. C. Mining District. Ottawa: Geological Survey of Canada, 1906.

CANADA .... BAEDEKER

Canada. By Karl Baedeker. Leipzig: Karl Baedeker, 1907. Maps and Plans. *Presented by the Author. To be Reviewed.*

CANADA .... HOPKINS

Progress of Canada in the Century. By J. Castell Hopkins. Toronto: The Linscott Publishing Co., 1902.

CANADA .... LAUT

Pathfinders of the West. By A. C. Laut. New York: The Macmillan Co., 1904. Illustrations and Map.

CANADA—GEOLOGY.

Annual Report of the Section of Mines for 1904. Ottawa: Geological Survey of Canada. 1906.

CANADA—GEOLOGY.

Summary Report of the Geological Survey Department of Canada for the years 1905 and 1906. Ottawa: 1906.

CENTRAL AMERICA .... NICHOLAS

Around the Caribbean and Across Panama. By Francis C. Nicholas. Boston: H. M. Caldwell Co., 1903. Illustrations and Maps.

CUBA .... WOOD

Opportunities in the Colonies and Cuba. By Leonard Wood and others. New York: Lewis, Scribner & Co., 1902.

MEXICO .... GEORGE

Das heutige Mexico und seine Kulturfortschritte. By Paul George. Beiheft zu den Mitteilungen der Geographischen Gesellschaft (fur Thuringen) zu Jena: 1906.

NORTH AMERICA—LABRADOR .... DUNCAN
Doctor Luke of the Labrador. By Norman Duncan. New York: Fleming H. Revell Co., 1904. Illustrations.

NORTH AMERICA—LABRADOR .... DUNCAN
Dr. Grenfell's Parish. By Norman Duncan. New York: Fleming H. Revell Co., 1905. Illustrations.

NORTH AMERICA—LABRADOR .... GRENFELL
The Harvest of the Sea. By Wilfred T. Grenfell. New York: Fleming H. Revell Co., 1905. Illustrations.

NORTH AMERICA—LABRADOR .... GRENFELL
Off the Rocks. By Wilfred T. Grenfell. Philadelphia: Sunday School Times Co., 1906. Illustrations.

QUEBEC—MINING .... LOW
Report on the Chibougamau Mining Region in the North part of the Province of Quebec. By A. P. Low. Ottawa: Geological Survey of Canada: 1906.

UNITED STATES.
The Franklin Bicentennial Celebration. Philadelphia, 1906. Philadelphia American Philosophical Society, 1906. Two copies. *Presented by Dr. John W. Harshberger and the American Philosophical Society.*

UNITED STATES .... ARCHER
America To-day. By William Archer. New York: Chas. Scribner's Sons, 1899.

UNITED STATES .... AUSTIN
Steps in the Expansion of our Territory. By Oscar P. Austin. New York: D. Appleton & Co., 1903. Maps.

UNITED STATES .... SPARKS
The Expansion of the American People. By Edwin Erle Sparks. Chicago: Foresman & Co., 1900. Illustrations.

UNITED STATES—ALASKA .... BAKER
Geographical Dictionary of Alaska. Second Edition. By Marcus Baker. (U. S. Geol. Surv. Bull. No. 299). Washington: 1906.

UNITED STATES—ALASKA .... BROOKS
Report on Progress of Investigations of Mineral Resources of Alaska in 1905. By Alfred H. Brooks and others. (U. S. Geol. Surv. Bull. No. 284). Washington: 1906. Illustrations and Maps.

UNITED STATES—ALASKA .... MARTIN
A Reconnaissance of the Matanuska Coal Fields, Alaska, in 1905. By G. C. Martin. (U. S. Geol. Surv. Bull. No. 289). Washington: 1906. Illustrations and Maps.

UNITED STATES—ALASKA .... PRINDLE
The Yukon-Tanana Region, Alaska. By L. M. Prindle. (U. S. Geol. Surv. Bull. No. 295). Washington: 1906. Maps.

UNITED STATES—APPALACHIANS .... GRATON AND LINDGREN
Reconnaissance of some Gold and Tin Deposits of the south Appalachian. By L. C. Graton with Notes on Dahlonega Mines by Waldemar Lindgren. (U. S. Geol. Surv. Bull. No. 293). Washington: 1906. Illustrations, Maps and Diagrams.

UNITED STATES—CALIFORNIA .... LEE
Geology and Water Resources of Owens Valley, Cal. By Willis T. Lee. (U. S. Geol. Surv., Water Supply Paper No. 181). Washington: 1906. Illustrations and Maps.

UNITED STATES—COLORADO .... DARTON
Geology and Underground Waters of the Arkansas Valley in East Colorado. By N. H. Darton. (U. S. Geol. Surv., Prof. Paper No. 52). Washington: 1906. Illustrations and Maps.

UNITED STATES—COLORADO .... DELLENBAUGH
The Romance of the Colorado River. By Frederick S. Dellenbaugh. New York: G. P. Putnam's Sons, 1902. Illustrations.

UNITED STATES—COLORADO .... JAMES
Indians of the Painted Desert Region. By George Wharton James. Boston: Little, Brown & Co., 1904. Illustrations.

UNITED STATES—COLORADO .... LINDGREN AND RANSOME
Geology and Gold Deposits of the Cripple Creek District, Colorado. By Waldemar Lindgren and Frederick Leslie Ransome. (U. S. Geol. Surv., Prof. Paper No. 54). Washington: 1906. Illustrations, Maps and Plans.

UNITED STATES—DISTRICT OF COLUMBIA.
Report of the Librarian of Congress and Report of the Superintendent of the Library Building and Grounds for fiscal year ending June 30, 1906. Washington: 1906.

UNITED STATES—GEODESY .... TITTMANN
Report of the Superintendent of the Coast and Geodetic Survey showing the progress of the work from July 1, 1905 to June 30, 1906. O. H. Tittmann, Supt. Washington: 1906.

UNITED STATES—GEOGRAPHY .... GANNETT
The Areas of the United States, the States and the Territories. By Henry Gannett. (U. S. Geol. Surv. Bull. No. 302). Washington: 1906. Map.

UNITED STATES—GEOGRAPHY .... GANNETT
Manuel of Topographic Methods. By Henry Gannett. (U. S. Geol. Surv. Bull. No. 307). Washington: 1906. Illustrations.

UNITED STATES—GEOLOGY .... EMMONS AND ECKEL
Contributions to Economic Geology. 1905. By S. F. Emmons and E. C. Eckel. (U. S. Geol. Surv. Bull. No. 285). Washington: 1906. Illustrations, Maps and Diagrams.

UNITED STATES—GEOLOGY..............................FULLER AND SANFORD

Record of Deep-Well Drilling for 1905. By Myron L. Fuller and Samuel Sanford. (U. S. Geol. Surv. Bull. No. 298). Washington: 1906.

UNITED STATES—GEOLOGY .... HOLMES

Preliminary Report on the Operations of the Fuel-Testing Plant of the U. S. Geol. Surv. at St. Louis, Mo., 1905. Joseph Holmes in charge. (U. S. Geol. Surv. Bull. No. 290). Washington: 1906.

UNITED STATES—GEOLOGY .... WALCOTT

Twenty-Seventh Annual Report of the Directors of the U. S. Geol. Surv. to the Secretary of the Interior. 1905-06. Chas. D. Walcott. Washington: 1906. Maps.

UNITED STATES—GEOLOGY .... WEEKS

Bibliography and Index of North American Geology, Paleontology and Mineralogy for the years 1901-05, inclusive. By Fred Boughton Weeks. (U. S. Geol. Surv. Bull. No. 301). Washington: 1906.

UNITED STATES—HYDROGRAPHY .... HARTON

Turbine Water Wheels Tests and Power Tables. By Robert E. Horton. (U. S. Geol. Surv., Water Supp. Paper No. 180). Washington: 1906. Illustrations, Plans and Diagrams.

UNITED STATES—HYDROGRAPHY ....VARIOUS AUTHORS

Destructive Floods in the United States in 1905. By Edward Charles Murphy and others. (U. S. Geol. Surv., Water Supply Paper No. 162). Washington: 1906. Illustrations and Maps.

UNITED STATES—HYDROGRAPHY ....VARIOUS AUTHORS

Report of Progress of Stream Measurements for the Calendar year 1905.
Part 8—Missouri River Drainage.
" 10—West Gulf of Mexico and Rio Grande Drainage.
" 11—Colorado River Drainage above Yuma.
" 13—Great Basin and Pacific Ocean Drainages in California, etc.
(U. S. Geol. Surv., Water Supply Papers No. 172, 174, 175, 177). Washington: 1906. Illustrations and Maps.

UNITED STATES—HYDROLOGY .... FULLER

Underground Water Papers, 1906. Myron L. Fuller, Geologist in charge. (U. S. Geol. Surv., Water Supply Paper No. 160). Washington: 1906. Illustrations and Maps.

UNITED STATES—LOUISIANA .... VEATCH

Geology and Underground Water Resources of North Louisiana and South Arkansas. By A. C. Veatch. (U. S. Geol. Surv., Prof. Paper No. 46). Washington: 1906. Illustrations and Maps.

UNITED STATES—MARYLAND.

Pliocene and Pleistocene. By William Bullock Clark, State Geologist. Baltimore: The Johns Hopkins Press. 1906. Illustrations and Maps. *Presented by the Maryland Geological Survey.*

UNITED STATES—MASSACHUSETTS .... WINSLOW AND PHELPS
Investigations on the Purification of Boston Sewage. By C. E. A. Winslow and Earle B. Phelps. (U. S. Geol. Surv., Water Supply Paper No. 185). Washington: 1906. Illustrations, Diagrams and Map.

UNITED STATES—MICHIGAN.
Eight Report of the Michigan Academy of Science, 1906. Ann Arbor: 1906.

UNITED STATES—MISSISSIPPI .... CRIDER
Geology and Mineral Resources of Mississippi. By A. F. Crider. (U. S. Geol. Surv. Bull. No. 283). Washington: 1906. Illustrations and Maps.

UNITED STATES—MISSISSIPPI .... CRIDER AND JOHNSON
Summary of the Underground Water Resources of Mississippi. By A. F. Crider and L. C. Johnson. (U. S. Geol. Surv., Water Supply Paper No. 159). Washington: 1906. Illustrations and Maps.

UNITED STATES—MISSISSIPPI RIVER .... OGG
The Opening of the Mississippi River. By Frederick Austin Ogg. New York: The Macmillan Co., 1904.

UNITED STATES—NEBRASKA .... SLICHTER AND WOLFF
The Underflow of the South Platte Valley. By Charles S. Slichter and Henry C. Wolff. (U. S. Geol. Surv., Water Supply Paper No. 184). Washington: 1906. Maps and Diagrams.

UNITED STATES—NEVADA .... SPURR
Ore Deposits of the Silver Peak Quadrangle, Nevada. By Josiah E. Spurr. (U. S. Geol. Surv., Prof. Paper No. 55). Washington: 1906. Illustrations and Maps.

UNITED STATES—NEW YORK .... BASSLER
The Bryozoan Fauna of the Rochester Shale. By Ray S. Bassler. (U. S. Geol. Surv. Bull. No. 292). Washington: 1906. Illustrations.

UNITED STATES—PENNSYLVANIA .... LEWIS
Quality of Water in the Upper Ohio River Basin and at Erie, Pa. By Samuel James Lewis. (U. S. Geol. Surv., Water Supply Paper No. 161). Washington: 1906. Illustrations and Maps.

UNITED STATES—TENN. AND KY. .... GLENN
Uuderground Waters of Tenn. and Ky. West of the Tennessee River. By L. C. Glenn. (U. S. Geol. Surv., Water Supply Paper No. 164). Washington: 1906. Illustrations, Maps and Diagrams.

UNITED STATES—WATER POLLUTION .... STABLER
Prevention of Stream Pollution by Distillery Refuse. By Herman Stabler. (U. S. Geol. Surv., Water Supply Paper No. 179). Washington: 1906. Illustrations.

UNITED STATES—WATER POLLUTION .... STABLER
Stream Pollution by Acid-Iron Wastes. By Herman Stabler. (U. S. Geol. Surv., Water Supply Paper No. 186). Washington: 1906.

United States—Wisconsin .... Thwaites
Down Historic Waterways. By Reuben Gold Thwaites. Chicago: A. C. McClurg & Co., 1902.

AMERICA—SOUTH.

Orinoco River .... Triana
Down the Orinoco in a Canoe. By S. Perez Triana. New York: Thos. Y. Crowell & Co., 1902. Map.

ASIA.

Asia .... Mahan
The Problem of Asia. By A. T. Mahan. Boston: Little, Brown & Co., 1900.

Asia .... Townsend
Asia and Europe. By Meredith Townsend. New York: G. P. Putnam's Sons, 1901.

China .... Colquhoun
Overland to China. By Archibald Colquhoun. New York: Harper & Bros., 1900. Illustrations and Maps.

China .... Douglas
China. By Robert K. Douglas. New York: G. P. Putnam's Sons, 1900. Illustrations.

China—Manchuria .... Seaman
From Tokio through Manchuria with the Japanese. By Louis L. Seaman. New York: D. Appleton & Co., 1905. Illustrations.

China—Manchuria .... Weale
Manchu and Muscovite. By B. L. Putnam Weale. London: Macmillan & Co., Ltd., 1904. Illustrations.

India .... Roberts
Forty-One Years in India. By Lord Roberts. New York: Longmans, Green & Co., 1901. Illustrations.

India .... Scidmore
Winter India. By Eliza Ruhamah Scidmore. New York: The Century Co., 1903. Illustrations.

India—Bombay.
Bombay Gazetteers. Vols. 1-26. Bombay: Government Press, 1877-1901. *Presented by the Indian Office.*

India—United Provinces .... Nevill
District Gazetteers of the United Provinces. 18 volumes. Compiled and edited by H. R. Nevill. Allahabad: Government Press, 1903-06. *Presented by the Indian Office.*

Japan .... Asakawa
The Russo-Japanese Conflict. By K. Asakawa. Boston: Houghton, Mifflin & Co., 1904. Illustrations and Maps.

JAPAN .... HEARN
Japan. An Interpretation. By Lafcadio Hearn. New York: The Macmillan Co., 1904. Illustrations.

JAPAN .... WATSON
Japan. Aspects and Destinies. By W. Petrie Watson. New York: E. P. Dutton & Co., 1904. Illustrations.

PALESTINE .... STEWART
Memorable Places among the Holy Hills. By Robert L. Stewart. New York: Fleming H. Revell Co., 1902. Illustrations and Maps.

EUROPE.

AUSTRIA.
A Keystone of Empire. Francis Joseph of Austria. (Anon). New York: Harper & Bros., 1903. Illustrations.

ENGLAND—CANTERBURY.
The Ancient City of Canterbury. Published by the Canterbury Chamber of Trade, with the co-operation and assistance of the Corporation of the City. Canterbury: Cross & Jackman, not dated. Illustrations and Maps. *Presented by the Canterbury Chamber of Trade.*

ENGLAND—LONDON .... LETHABY
London before the Conquest. By W. R. Lethaby. London: Macmillan & Co., 1902. Illustrations and Map.

EUROPE .... ALLEN
The European Tour. By Grant Allen. New York: Dodd, Mead & Co., 1901.

FRANCE .... JOHNSON
Along French Byways. By Clifton Johnson. New York: The Macmillan Co., 1900. Illustrations.

GREAT BRITAIN .... MCKIE
Summer Rambles. By Thomas McKie. Edinburgh: David Douglas, 1906. *Presented by the Publisher. To be Reviewed.*

GREAT BRITAIN—ENGLAND .... TOZIER
Among English Lanes. By Josephine Tozier. Boston: L. C. Page & Co., 1904.

ITALY .... HOOKER
Wayfarers in Italy. By Katherine Hooker. New York: Chas. Scribner's Sons, 1902. Illustrations.

ITALY .... WHARTON
Italian Days and Ways. By Anne Hollingsworth Wharton. Phila.: J. B. Lippincott Co., 1906. Illustrations. *Presented by the Publishers. To be Reviewed.*

ITALY .... WILLARD
The Land of the Latins. By Ashton Rollins Willard. New York: Longmans, Green & Co., 1902. Illustrations.

Italy—Tuscany .... Carmichael
In Tuscany. By Montgomery Carmichael. New York: E. P. Dutton & Co., 1901. Illustrations.

Russia .... Ganz
The Land of Riddles. (Russia of To-Day). By Hugo Ganz. Translated and edited by Herman Rosenthal. New York: Harper & Bros., 1904.

Russia .... Von Schierbrand
Russia. Her Strength and Her Weakness. By Wolf Von Schierbrand. New York: G. P. Putnam's Sons, 1904. Maps.

Spain .... Hume
The Spanish People. By Martin A. S. Hume. New York: D. Appleton & Co., 1901.

OCEANIC AND THE POLAR REGIONS

Antarctic Regions ....Nordenskjold and Andersson
Antarctic. By N. Otto G. Nordenskjold and Joh. Gunnar Andersson, New York: The Macmillan Co., 1905. Illustrations and Maps.

Hawaii .... Whitney
Hawaiian America. By Casper Whitney. New York: Harper & Bros., 1900. Illustrations.

Philippines .... Robinson
The Philippines. The War and the People. By Albert G. Robinson. New York: McClure, Phillips & Co., 1901.

Spitzbergen.
Missions scientifiques pour la Mesure D'Un Arc de Méridien au Spitzberg. Entreprises en 1899-1902 sous les auspices des Gouvernements Suédois et Russe Mission Suédoise. Tome 1. Astronomie et Géodésie; II Sec., Travaux Géodésiques. B. Mesure des angles horizontaux et verticaux. V Sec., Marégraphe, Nivellement. Tome II. Physique Terrestre. Météorologie. Historie Naturelle; VII Sec., Magnétisme Terrestre. A. Levée Magnétique du Spitzberg; VIII Sec. Météorologie. A. Observations Régulières à la Station D'Hivernage. B. Radiation Solaire; BI. Etats des glaces et de la Neige; BII. Forme et Grandeur des cristaux de Niege; BIII. Observations Météorologiques faites à la station de montagne; BIV. Observations Météorologiques et Hydrographiques faites en mer 1899; BV. Observations Météorologiques en mer 1901; C. Aurores Boréales; X Sec., Botanique. Stockholm 1903-1906. Illustrations. *Printed by the Commission Royale du Spitzberg.*

MISCELLANEOUS.

Bright
The Story of the Atlantic Cable. By Chas. Bright. New York: D. Appleton & Co., 1903. Illustrations.

JOHNSON

American Railway Transportation. By Emory R. Johnson. New York: D. Appleton & Co., 1907. Illustrations and Maps. *Presented by the Author.*

JOHNSON

Inland Waterways. By Emory R. Johnson. Phila.: American Academy of Political and Social Science. 1893. *Presented by the Author.*

JOHNSON

Ocean and Inland Water Transportation. By Emory R. Johnson. New York: D. Appleton & Co.. 1906. Illustrations. *Presented by the Author.*

KIRCHHOFF

Mensch und Erde. By A. Kirchhoff. Leipzig-Berlin: B. G. Teubner, 1905. *Presented by the Publisher.*

KROPOTKIN

Fields, Factories and Workshops. By P. Kropotkin. New York: G. P. Putnam's Sons, 1901.

EGYPTOLOGY .... **MULLER**

Egyptological Researches. Results of a Journey in 1904. By W. Max Muller. Washington: Carnegie Museum of Washington, 1906. Illustrations. *Presented by the Publishers.*

MAPS.

EGYPT .... **BARTHOLOMEW**

Map of Egypt and the Lower Nile. Edinburgh: 1906. *Presented by John Bartholomew & Co.*

ONTARIO.

Map of Ontario, Guelph Sheet. Ottawa: 1906. *Presented by the Department of the Interior, Canada.*

Pilot Charts of the North Atlantic Ocean for Dec., 1906, and Jan. and Feb., 1907. *Presented by the U. S. Hydrographic Bureau.*

Pilot Charts of the North Pacific Ocean for Jan., Feb. and March., 1907. *Presented by the U. S. Hydrographic Bureau.*

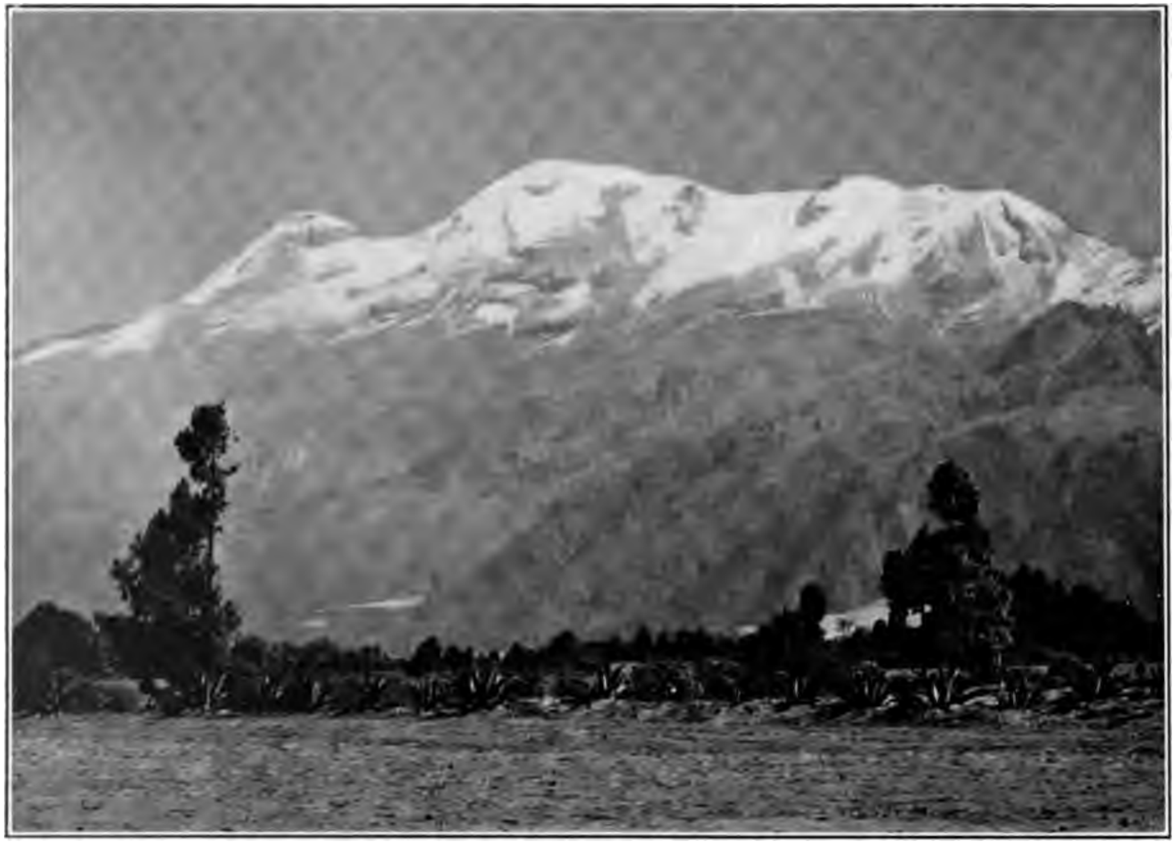

FIG. 1.—INTACCIHUATL FROM THE WEST.

A RECENT ASCENT OF IXTACCIHUATL.

By Charles Gilchrist.

Amecameca is no longer the starting point from which to climb Popocatepetl or Ixtaccihuatl for within a few years Popo Park has sprung into existence. Here is a delightful little inn well situated in a grove of pines about four miles from Amecameca and forty miles from Mexico City by rail. The place is managed by Captain D. Carlos Holt in a way that makes one want to come back. Here one will take more delight in eating than anywhere else in Mexico.

Captain Holt makes it a part of his business to outfit expeditions for Popocatepetl. Between January 22 and February 16, 1907, I made four excursions to these two mountains from Popo Park. In the first trip I ascended to the crater of Popocatepetl, and the following three trips were necessary to reach the summit of Ixtaccihuatl. Altogether I spent fourteen days upon the mountains. The outfit usually consisted of four Mexicans, two horses and a pack mule loaded with the necessary camping paraphernalia. One of the Mexicans looked after the camp and cooking. Another looked after the horses, and I regret to say, almost never had them at the appointed spot when I returned from the snows and especially wanted a lift back to camp. The other two Mexicans were called guides and (on Ixtaccihuatl at least) I made the mistake at first of considering them as such. They are good porters and are strong and well adapted to high altitude. All of this outfit was furnished by Captain Holt at a moderate cost of about $9.00 a day.

Popocatepetl (altitude about 17,800 feet) is now quite frequently the object of an ascent. Perhaps one reaches the crater out of every four that attempt it, the difficulty being the rarity of the air and consequent exhaustion and sickness.

Ixtaccihuatl seems to have rather generally foiled the attempts of climbers, and no doubt this made me the more anxious to try it. I first tried the south *arete* leading up from the pass towards Popocatepetl, but was forced to be satisfied with reaching the

"Feet" or south knob of the mountain which is perhaps 600 feet lower than the "Breast" or highest point. This route offered fine rock climbing over a very bold part of the mountain. After crossing the rolling grazing ground in the pass it is necessary to traverse about the high rock known as the Cerro Gordo. I spent two nights at the foot of the cliffs of the Gordo, one of them in the most romantic spot imaginable, at the top of a steep slope, and at the base of a precipice. The slope was snow-covered at the time and below us it pitched down at an appalling angle to the top of some cliffs which descended vertically into a great unseen gulf. This spot was considerably over 14,000 feet above the sea. The night was still and very cold, and through it all a brilliant moon hung over the landscape and illuminated the crags and snow about us with its magic light. At four o'clock in the morning we commenced to cross the slope by the light of the moon, and by six we reached a neat little saddle separating the Gordo from the main *arete* of Ixtaccihuatl. Here we looked down upon a wonderful sight. The eye followed down immense crags on the east face of the mountain, and across the great plains towards the east, where the sun was just beginning to lighten the horizon with the first tints of daylight, and against this glow, standing out sharply and clearly, was Orizaba.

From here up the east side of the mountain presented a series of steep *couloirs* separated by the boldest possible *aretes*. These subsidiary *aretes* branched out from the main ridge we were climbing and descended in jagged and fantastic forms between the gulfs they separated. Dr. Freudenberg speaks of these gulfs as *"kars,"* that is basins rounded out by formerly existing glaciers. A little before noon I reached the top of the south knob in an exhausted condition. I had taken nothing to eat since the day before, owing to a fear of consequent nausea. It was clear I could not reach the "Breast" and return to camp at the Gordo that night. The top snows were soft so that plodding through them was extremely fatiguing.

My following attempts upon Ixtaccihuatl were confined to a more direct route by way of the western slopes from Amecameca. The failure of the second trip was due to villianous weather, and a bad condition of the snow. I was out for three days, but was forced to give up when at an altitude of about 15,400 feet. The bad weather was in a measure compensated for by the wonderful effects in clouds, especially at the higher altitudes, and at time of

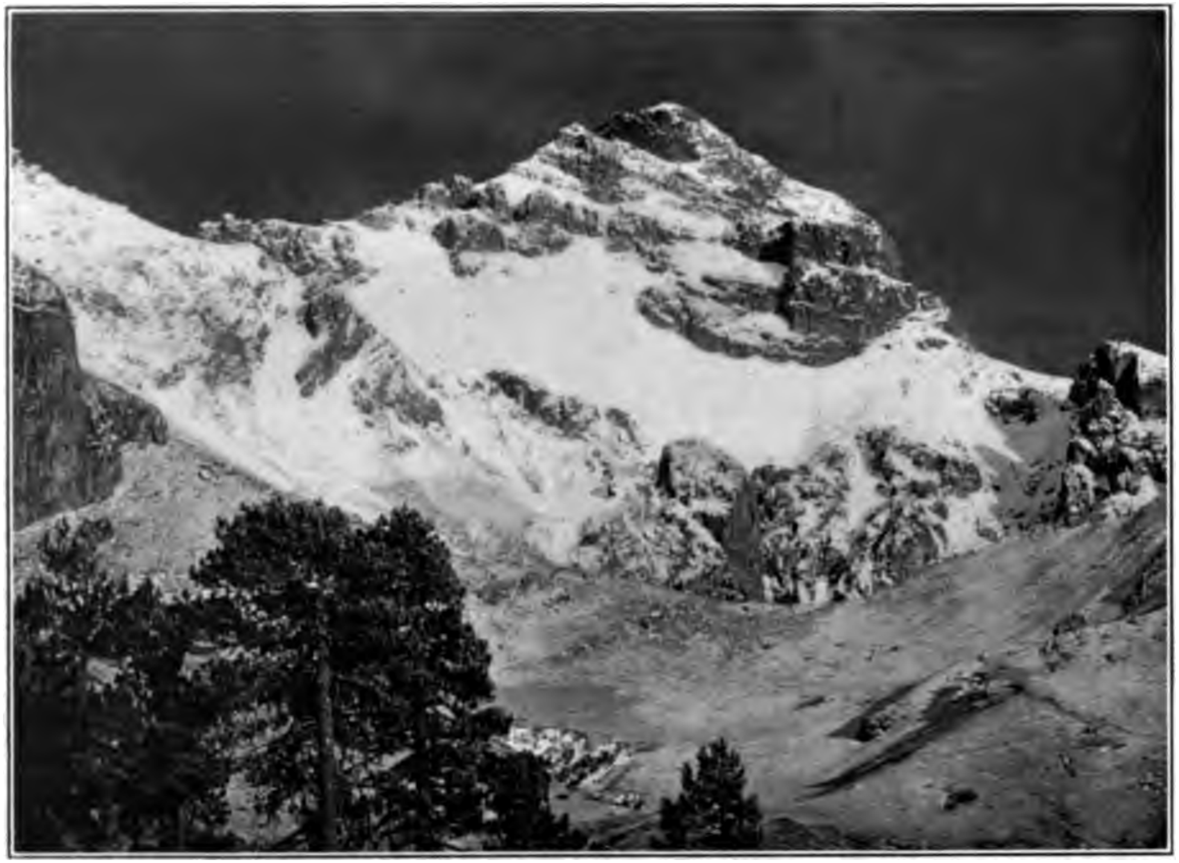

Fig. 2.—Cerro Gordo from the Southwest. (Showing Snow Field that was Crossed.)

sunrise and sunset. These effects were characterized by very rapid changes and by weird and high coloring unlike anything I had ever seen below. The sky and cloud area was not confined to the half of the celestial sphere above the horizon, but extended as well, far into the depths below.

The ascent by the west flanks of Ixtaccihuatl is more picturesque than that up the Puebla Road as followed for the climb on Popocatepetl. The outskirts of Amecameca are attractive; fields and gardens with flowering borders, and the quaint adobe buildings of the natives. There is a burro trail up the mountain as far as the cave of Cholula. When the real ascent begins the trail plunges into a forest with rank undergrowth, and in the way are old gnarled trunks about which the horses must wind their way. A little farther and our caravan entered a veritable gully, the bushes meeting overhead and our mule almost scraping his pack against the sides. In Mexico, it is quite common for a road to be sunk into a ditch with vertical sides.

At an elevation of about 12,500 feet the trail winds up the less steep side of a bold knob called the "Bee Hive." On the south this knob has a perpendicular face and on one side are numerous prinnacles and grotesque rock forms. The Bee Hive is easily ascended and from its top there is a view of a fine precipice which exhibits the columnar structure of the older lavas to a marked degree. Higher up, the horses pass along the crest of a narrow ridge with a huge grassy amphitheatre on one side and a beautiful valley on the other at the head of which the Cerro Gordo appears to fine advantage. On quitting this ridge we dropped over its south side, and followed a series of low cliffs running at right angles to the mountain, and everywhere full of caves. Many of these would make fair shelter, but the cave of Cholula is the best of them all.

Altogether I spent five nights in this cave and I was more comfortable there than in any other camp on the mountain. The cave has a fairly level floor and is deep and roomy, varying in height from three to seven feet. There was no annoyance from smoke which clung closely to the roof in passing from the fire at the back wall to the mouth of the cave, at the same time causing just enough fresh air to pass in along the floor. Water and wood were close at hand.

Early in the morning (on my third expedition) I left the cave and proceeded on horse back over the same rough ground we had ridden over on the previous trip. As soon as the horses were left I went ahead and paid no attention to suggestion from the Mexicans. By daylight we were in the V-shaped depression through which the water from the glacier discharges and, where the two moraines come almost together. Here I climbed directly up the north moraine and followed its back to its termination against a cliff, the top of which it just reaches. Then followed a long slope of mixed snow, ice and loose rocky material where the footing was difficult to find, and by degrees this gave way to the pure snow slopes of the upper part of the mountain. A stamp of the foot would break the surface crust, and form a fair foothold in the underlying snow. I felt satisfied that had we reached this slope four or five days earlier, instead of the one on the other side of the glacier, where we had failed, we should have had no better luck with it, for then the surface snow would have been as soft and powdery on the one as on the other. The slope I was on had the same icy surface about six inches below the crust, which had evidently formed over the top in the clear days since our previous attempt. As in the other ascents at these altitudes I found better progress in rythmic breathing and climbing, and with avoidance of the continual turning to inspect the panorama.

The highest exposed cliffs might be called the "Eyelid Cliffs" from their resemblance to a closed eye when seen at a distance. They are fine rocks surrounded by snow on all sides and festooned with icicles. When I arrived at these cliffs, both of the Mexicans were nearly beyond calling distance behind me, and although they had my apparatus, I was too anxious to reach the summit to wait for them, and in fact, neither of them did reach the top at all. As the grade lessens and rounds over to the top the crust disappears and the snow becomes soft. At eleven o'clock I reached the top entirely alone, wading in snow knee deep. The day was perfectly cloudless everywhere, but there was a cold, sharp wind from which I had been sheltered on the slope until within a few feet of the top. The summit consists of three elevation, all in pure white snow without a break. The lowest or southeastern one presents a cornice on the side of the glacier. I might say that all the cornices along the top from here to the south point are on the west

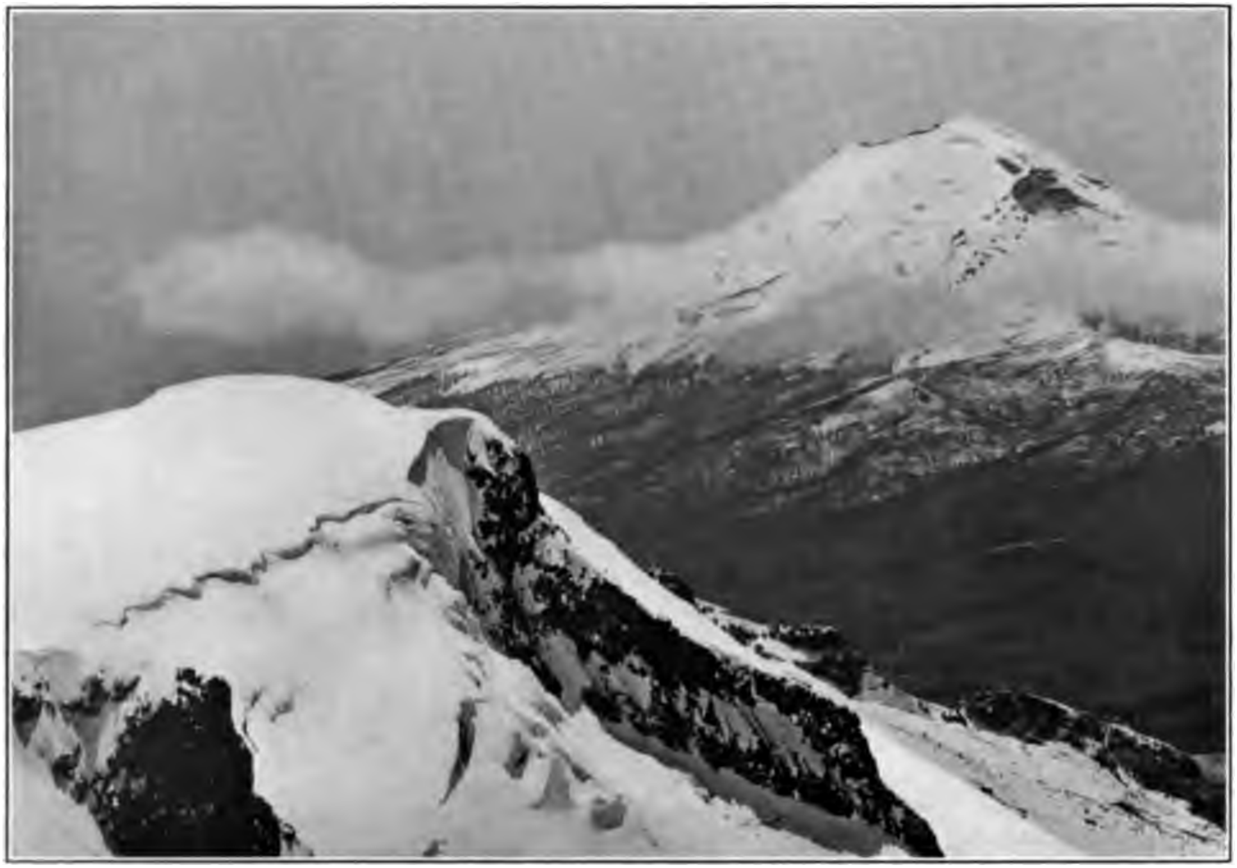

FIG. 3.—POPOCATEPETL FROM THE SUMMIT OF INTACCIHUATL.

side of the ridge, showing clearly the direction of the prevailing winds. On nearing the top the southeastern elevation appeared to be the highest so I climbed out to that first. The other two crests are so nearly of the same height that it is impossible to tell the difference with the eye. Together they make a rolling area perhaps as large as a ball field. The northern point shuts off the view of the "Head" of Ixtaccihuatl from the southern point. In the other direction, the view of the glacier with the "Feet" and Popocatepetl in the distance, is grand.

After about half an hour at the top I started down and shortly met one of the Mexicans with my apparatus. Here, in a spot a little more sheltered I wrestled with the hypsometer for half an hour. The wind kept blowing it out and my fingers were too cold to be of much use. Finally, as the water began to boil, my thermometer broke without apparent cause—it was the only one I had and I did not get the reading. Ixtaccihuatl is probably within 400 feet of 16,500 feet altitude.

After reaching the top of a coveted mountain summit one does not care much how he gets down. Those tired and footsore hours soon pass into oblivion in the memory of a glorious outing with one objective point attained. At the cave was solid comfort, and in enjoying it I first put in fourteen hours of sleep.

I spent an extra day in exploration in the vicinity of the cave, which included a return to the glacier to photograph an ice cave in the tongue. The horses went back from the cave by the route we had come, and I proceeded on foot to the base by way of the bold ravine which heads up at the northwest face of the Cerro Gordo. To reach this ravine involved some very interesting cliff work, for this section is intersected by crags and precipices everywhere.

The difficulties to be encountered upon Ixtaccihuatl are not truly Alpine. The summit can be reached by the way described without climbing a single cliff or crossing a single crevasse. Two things are necessary for success—a fair condition of the steep snow slopes for climbing, and a certain amount of adaptation for high altitudes. At this time Ixtaccihuatl offers peculiar attractions to the mountain enthusiast, not only on account of the excellent base of operations existing at Popo Park, but because of the fascination of a comparatively unexplored upper region.

A RECENT VOLCANO IN THE SAN FRANCISCO MOUNTAIN REGION, ARIZONA

By Douglas Wilson Johnson,
Assistant Professor of Geography in Harvard University.

Fifty miles southeast of the Grand Cañon of the Colorado the ancient volcanic cone of San Francisco Mountain rises 6,000 feet above the general level of the plateau. The once symmetrical form of the volcano has been so much dissected by streams and glaciers, that we may regard it as in a more or less mature stage of its erosion history. On the plateau about its base are numerous smaller volcanoes composed of a different type of igneous rock, and belonging to a later period of activity than the main volcano. These are in various stages of erosion, from extreme youth to maturity. Many of them have well-preserved craters, in some of which small lakes have accumulated. In others the craters have been breached at one or more points by erosion, and the internal structure of the volcanoes well-exposed. In still others the craters have been completely demolished, the sides of the cone maturely dissected by broadly open ravines or creases, and its former symmetry effectually destroyed. As cones in the several stages of erosion may be of the same general composition and structure, and subjected to the same erosive influences, it seems probable that they represent different eruptions at more or less widely separated times. Many of them are simple cinder cones, but others are composed in part of lava flows, originating in the numerous vents about the base of the more ancient San Francisco volcano.

Near the northern edge of the volcanic field, and sixteen miles due north of the main volcano is found a small cinder cone and an associated lava flow, which present features worthy of brief description. Located some distance east of the road between Flagstaff and the Grand Cañon, the cone and flow are not so accessible as many others whose appearance is less striking. While we were

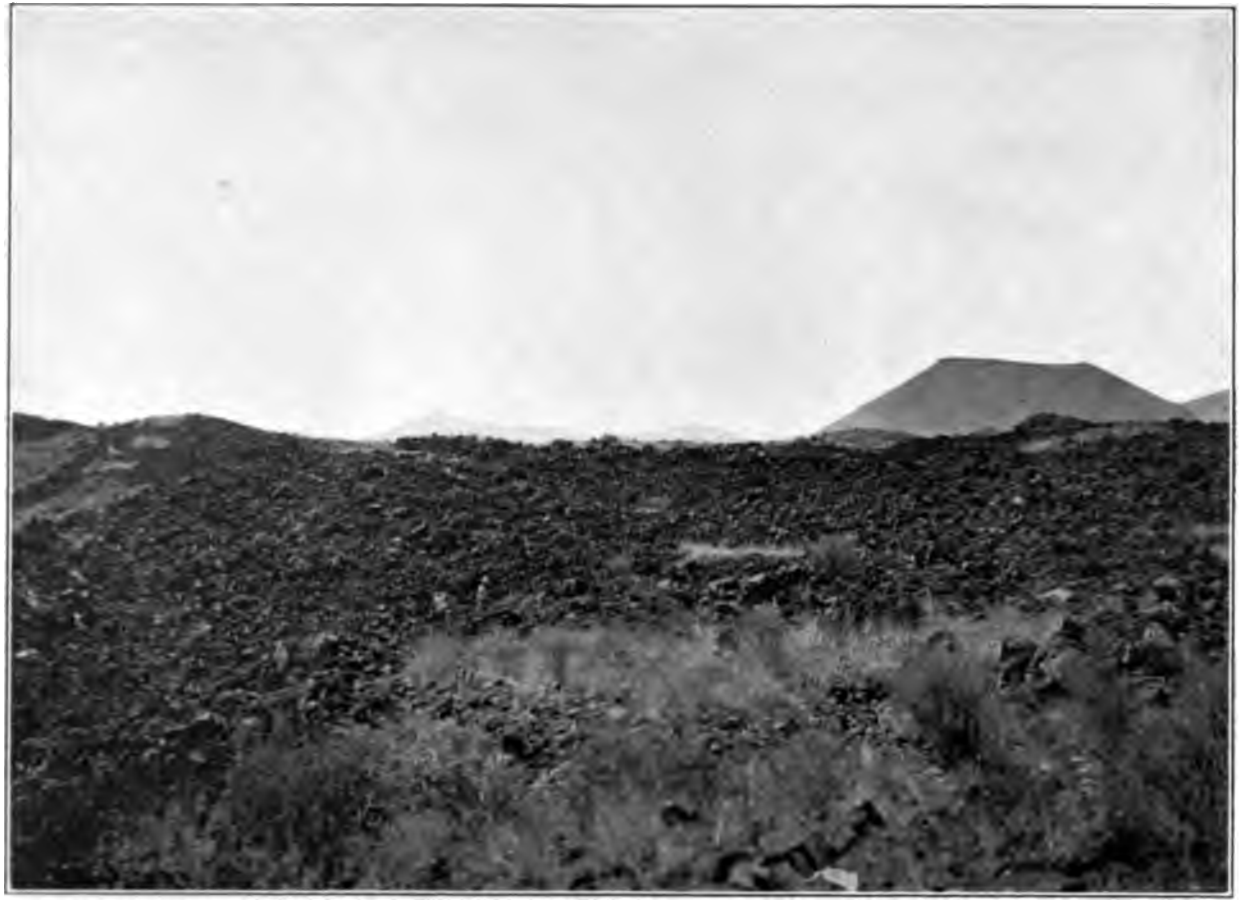

Fig. 1.—Northern Margin of Lava Flow. (Cone in the Background.)

crossing the Colorado Plateau in the course of a wagon trip from Prescott, Arizona, to Salt Lake City, Utah, in the summer of 1906, we saw the black edge of the lava flow and the symmetrical outline of the cone six or eight miles south of the wagon trail we were following. In company with Dr. H. W. Shimer, of the Massachusetts Institute of Technology, I made a side trip on horseback to visit them.

The lava flow emerges from the northern base of the cone, and spreads away to the north and east in an ever-winding sheet. In places the edge of the flow is distinctly scalloped or even lobate, as indicated in Fig. 3. The figure is based partly on a field sketch, and partly on a photograph taken from the summit of the cone. It shows the general relations fairly well, but is not accurate in detail, especially in the northwestern part which was several miles distant from the point of observation.

The surface of the flow is exceedingly rough, and belongs to the type to which the name *aa* has been given. At no point which we visited was there any trace of that portion of the lava which must have been more or less fluid when the flow was in motion. Nothing could be seen except angular fragments of lava thrown loosely together. In detail, the appearance is that of an accumulation of fragments which rained down upon the country after some great volcanic explosion. It is only when the whole field is viewed from the summit of the cone that the impression of a distinct "flowing" is gained. That the flow is in its original condition, untouched as yet by erosive agents, is quite evident. There can be no question that when the lava stopped where we now see it, it presented the same appearance that it does to-day: a steep wall of jumbled lava blocks leading from the surrounding plain abruptly up to a higher and rougher surface covered by the same lava blocks—the surface of the flow.

Near some portions of the margin the lava blocks are arranged in crescentic ridges higher than the rugged surface just back of them. This is well shown near the base of the cinder cone along the eastern margin of the flow. These ridges apparently consist of lava blocks carried to their present position by the advance of the lava when the under part was fluid, and left higher than the adjacent portions of the sheet, when the withdrawal of the liquid underflow allowed the adjacent portions to sink. The margin itself could not sink because it was composed of hardened lava fragments from top to bottom.

The ruggedness of the surface of the flow is not due to the character of the fragments alone, but in part to the irregular manner in which they are heaped together. In places they are piled up to a height of fifty feet above the average level of the flow; elsewhere are depressions as much below the average level. The surface is often an irregular series of knobs and depressions with a total relief of a hundred feet or more, as though the lava blocks had been dropped here and there in giant cart loads. It justifies the name locally given to it, "The Devil's Race Track."

An examination of the lava fragments shows that many of them are blocks of columnar basalt. Sometimes great shells of lava, two to four feet thick and many square feet in surface extent, are seen lying with the loose blocks, or tilted on edge in every conceivable direction. These shells are subdivided by joint planes into polygonal blocks, the separation of which accounts for a large part of the lava fragments. Toward the northern margin, however, a greater proportion of irregular fragments and pieces of ropy or twisted lava were found. It seems clear that the surface of the flow cooled sufficiently for a hardened crust to form, while later movement broke up the crust, giving the jointed shells or plates of lava, and the loose blocks and irregular fragments. This process has probably been repeated many times, so that now the loose material effectually conceals the more solid portion of the flow which was fluid during the last stages of the lava advance.

The contrast between this flow and other adjacent lavas leaves no doubt of its comparatively recent formation. Erosion has produced no effect upon it, while the others have suffered extensively. The older lavas are much weathered as compared with the newer flow and it is only where some stream bed furnishes a fresh exposure of the former that there is any resemblance between the two. The older lavas are pretty well buried under a soil which supports a fair amount of desert vegetation. The new flow is fresh and black, and has practically no soil except where the winds have blown dust and sand upon its surface from the adjacent areas. As seen from the summit of the cone, the flow has been invaded by the soil along its margins where some desert vegetation finds opportunity to grow. The central areas are in much the same condition in which

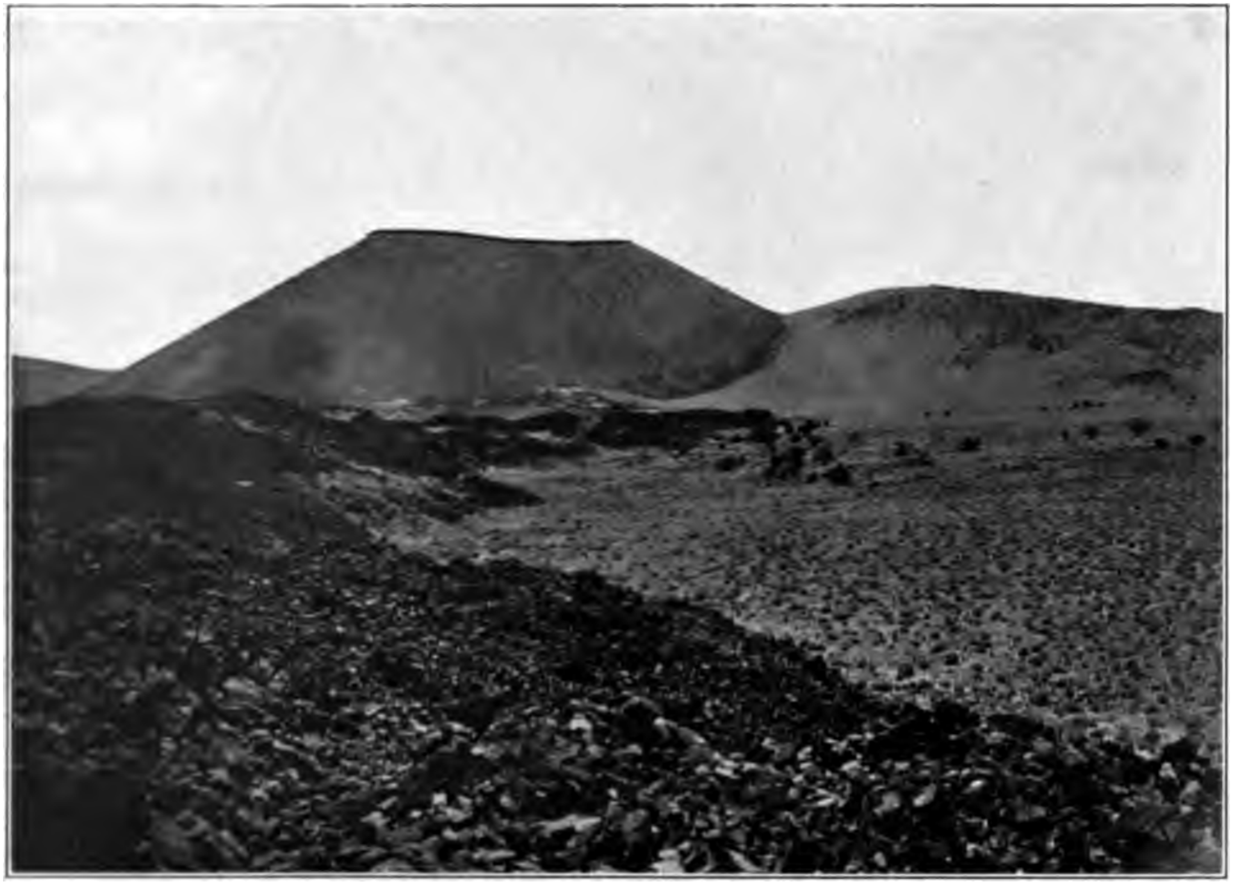

FIG. 2.—CINDER CONE AND WESTERN EDGE OF THE LAVA FLOW. (SHOWING VEGETATION ON THE CONE.)

they were left at the close of the volcanic activity. Fig. 1, show the surface of the flow near its northern margin, and Fig. 2 a portion of the western edge of the flow.

The cinder cone rises 500 feet or more above the general level, and contains a perfectly formed crater in its summit 150 or 200 feet deep, as indicated by the cross section, Fig. 4. Both inner and outer slopes are remarkably smooth and symmetrical and are as steep as it is possible for the loose material to remain at rest. This material varies from the finest lapilli to fragments several inches in diameter; some larger bombs are found on the outer slope, but are most abundant on the rim of the crater and on its inner slope. The ascent of the cone is fatiguing because one's feet sink into the finer material at every step. Some vegetation has taken root on the cone, especially toward its upper part.

The western side of the cone overlaps and partially conceals an older volcano, shown in Fig. 2, which has suffered extensive erosion. The contrast between the two is very marked. Most of the slopes of the older volcano are due to erosion, the initial form having been pretty well destroyed. All slopes of the recent cone are original. Open ravines separated by rounded divides, both covered with a considerable amount of coarse soil supporting a desert vegetation, characterize the older cone; while the absence of ravines, and a scarcity of soil and vegetation, mark the new cone. The older volcano seems to have consisted in part of compact lava, as outcrops of such rock were found on its northern slope, the only side visited by us. So far as we could determine the recent cone consists entirely of fragmental material.

Even when viewed from a distance of some miles, the summit of the volcano or rim of the crater, is seen to be capped by a dark ridge or "collar" which projects beyond the normal slope of the cone in the manner shown in Fig. 5. When observed close at hand, this "collar" proves to be composed of volcanic bombs lying at the apex of the inner and outer slopes. The bombs vary greatly in form and size, some being of typical bomb shape, others long, bent spindles of twisted lava; some are small, others quite large. One which we measured was about nine feet long and five feet in greatest thickness. It would seem that the tendency of the larger bombs to fall near the vent, and the fact that bombs falling elsewhere than on the apex of the two slopes would slide down the slopes and be covered by the cinders, have combined to form the projecting "collar." Fig. 6 is reproduced from a small kodak view taken by Dr. Shimer, which has been slightly retouched by pencil, and which shows the appearance of the bombs as seen from the top of the "collar" itself.

Where the lava emerges from the northern side of the volcano there is no evidence that the cone has been in any way deformed.

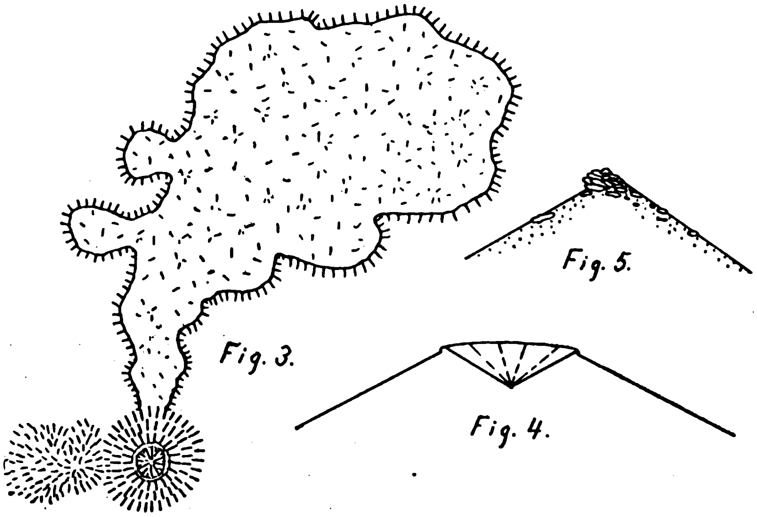

Fig. 3.—Sketch Map of Cinder Cone and Lava Field. Older Volcano Just West of Cinder Cone.
Fig. 4.—Section Through Cinder Cone.
Fig. 5.—Enlarged Portion of Sectional View, Showing Collar of Volcanic Bombs.

Had the cone been produced first, and had the lava burst from its base, some degree of deformation would most likely have resulted, due to the removal of some of the cinders, and a consequent readjustment of the slope of the cone at that point. In the absence of such deformation it seems probable that the cone represents, in large part at least, the later phases of the volcanic activity, the lava flow having been erupted first.

There can be no doubt of the comparative recency of the eruption which formed the cone and flow. It certainly occurred

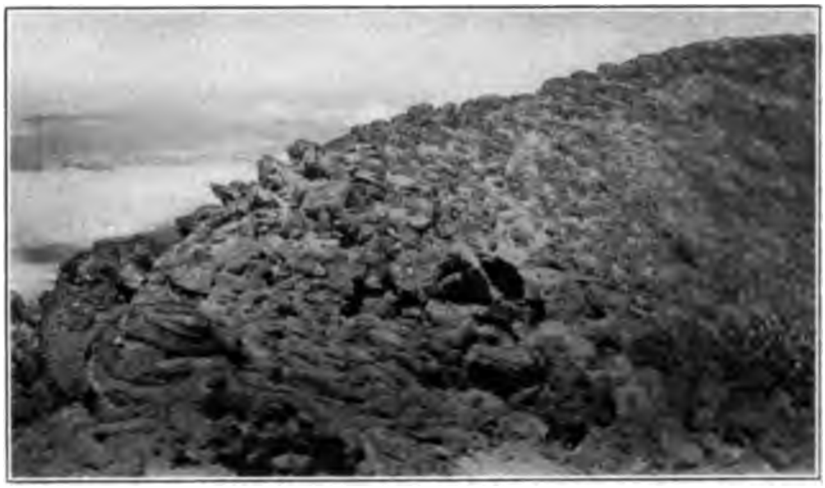

FIG. 6.—COLLAR OF BOMBS ALONG THE RIM OF THE CRATER.

at a much later period than those eruptions responsible for the many other cones which we had an opportunity to see during our short stay in the San Francisco region. But when an attempt is made to estimate the lapse of time since the eruption, we lack the necessary data. The portion of the flow which we examined spread over a desert region, where there were no trees or other landmarks about which the lava might have made its way. I believe that a century or two at most would account for all the changes that time has effected on either cone or flow.

How the eruption compares in age with other recent eruptions in the United States I am unable to say, having no satisfactory data upon which to base a computation. Dutton describes a very recent flow found in the Unikaret Mountains north of the Grand Cañon; but is unable to assign a date for the eruption, although he thinks it may be more recent than the Spanish conquest. (Tertiary History of the Grand Cañon District, Monograph II, U. S. G. S., p. 111-112, plate XXI.) Diller has given a very full account of "A Late Volcanic Eruption in Northern California" (Bulletin 79, U. S. G. S.), both the cone and the flow produced by this eruption showing features closely similar to those described in this paper. According to Diller's account the cone, an older lava, and a surrounding ash field were produced by a first phase of the eruption, a more recent lava being extruded from the base of the cone at a later period. The cone is almost devoid of vegetation, but trees have grown upon the ashes and both lava flows. Judging from the age of the trees, the cone and earlier flow were probably erupted a little more than two hundred years ago, while the later flow must have been extruded at least sixty-five years before the present time.

According to Mr. Henry H. Robinson of Yale University, who has spent some time in studying the volcanic phenomena of the San Francisco Mountains, there are other recent flows in the district less noticeable than the one here described because they rest on older lava, almost as dark in color as themselves, instead of directly on the limestone platform of the plateau. Mr. A. E. Hackett of Flagstaff, Arizona, showed me photographs of a recent lava flow and cinder cone located east of the main San Francisco Peak, the cone being locally known as Sunset Mountain. Judging from the photographs the cone is distinctly older than the one here described.

THE RECLAMATION AND CULTIVATION OF SALT MARSHES AND DESERTS

By John W. Harshberger, Ph.D.,
Assistant Professor of Botany in the University of Pennsylvania.

Salt marshes are of wide distribution in North America. They occur at the head of the Bay of Fundy in Nova Scotia and New Brunswick, in Massachusetts, Connecticut and New Jersey, extending southward to Florida. In California along the Sacramento River, the salt marshes gradually merge with the tule marshes of that river. The problem in the near future will be to reclaim these marshes from the sea and cultivate upon the sweetened land the crops best suited to such soil conditions. The arid lands of the southwestern United States and of Mexico, which are capable of cultivation, may be separated into two general divisions, viz., the irrigable arid lands and the non-irrigable arid lands. As the mineral salts are generally abundant both in salt marsh soils and in many arid soils of the west and the southwest, the scientific principles involved in the reclamation of such soils resolve themselves into first, a study of the mineral salts, and second, the most approved means of removing such objectionable salts from the superficial layers of the soil, where they might injure seriously the growing crop. To sketch the problems concerned in the reclamation of salt marshes, alkali flats and arid lands in various parts of America is the object of the following article.

First, we must consider the conditions as they exist on the salt marshes of Nova Scotia, where they are of a remarkable character. At the head of the Bay of Fundy in New Brunswick and Nova Scotia are found extensive salt marshes that in places merge into fresh-water bogs. These marshes possess peculiarities which differentiate them from the ordinary salt marshes in this country and in Europe. They exist in their typical development at the heads of Minas Bay and Chignecto Bay, and in both places were visited by the writer. Seen from the neighboring ridges, the marshes have a characteristic, but a beautiful aspect. They are treeless, almost flat, and are covered with dense, rich grasses, the color of which vary with the season: bright green in spring, almost yellow at harvest time and brown in winter. These marshes stretch as far as the eye can reach with their continuity broken only by the tidal rivers and estuaries which outside the dikes constructed by the inhabitants are margined by narrow fringes of wild unreclaimed marsh. Nobody lives upon the marshes, but barns are scattered here and there over their surface, where the hay and other produce are stored. Large hay stacks also break the monotonous level. The tidal rivers wind in a sinuous course through the marshland and at low tide, they are to be distinguished by the deep precipitous channels lined with slippery, red mud that gleams in the sunlight. As the tidal waters rush tumultuously in and out, they carry fine, red mud in solution, which is deposited on the level tidal flats, or in the quieter reaches of the intersecting rivers. As these marshes exist in a region of subsidence, the depth of the mud is constantly increasing by the deposit of a thin layer of new material each time that the tide runs out. It has been determined that the depth of fine soil in some of the marshes is at least eighty feet. The red mud, which is held in solution by the salt water, is derived from the red Permo-Carboniferous sandstones forming the sides and bottoms of the channels between the marshes and the Bay of Fundy. These soft rocks are according to Ganong* rapidly eroded by the strong tidal currents which in their onward rush to the northeast, carry the detritus whirling in suspension to drop it as their force is checked by their quiet spread over the marshes at the highest tides.

The marsh soil thus formed is of a fine reddish color, but in the unreclaimed condition it contains so much sea salt (common salt) that ordinary plants cannot grow. The original salt marsh vegetation indicates in a very definite way the salinity of the soil. The characteristic plant at the immediate edge of the salt water, extending typically in a strip just above and below ordinary high tide mark is the salt enduring plant, the marsh grass (Spartina stricta glabra), distinguished, according to the observations of the writer, by its bright, green color. Inside of the outer strip, extending from the lowest high tide mark, to the highest mark is a part

*W. F. Ganong. The Vegetation of the Bay of Fundy Salt-marshes, Botanical Gazette, XXXVI, 167-168.

of the wild salt marsh occupied by the marsh samphire (Salicornia herbacea) and tall sea blite Suaeda linearis, together with the varieties of spreading orache, Atriplex patula. The highest strip of the unreclaimed salt marsh is covered only by exceptionally high tides. It is occupied by such plants as sea lavender (Statice [Limonium] carolinianum); goose tongue, or plantain (Plantago maritima), fox grass, or mezotte (misette 1685) (Spartina juncea) and black grass (Juncus Gerardi) with several other plants of minor importance.

The reclamation of the salt marsh begins with the construction of dikes to shut out the sea. These dikes must be high enough and strong enough to repel the attacks of the highest tides, ordinary tides rising and falling a distance of thirty-eight to forty-five feet. When the sea is finally shut out from the marshes, draining ditches are dug to permit the rain water to run off. This rain water as it falls on original saline soils penetrates to the subsoil, as far as the depth of the drainage ditch, and leeches out the salt as it filters through the soil. Ultimately enough salt is washed out so that in two or three years, the soil is sweet and fresh enough to grow ordinary grass crops. The rain water containing the washed out salts is carried by larger ditches to the dikes where an outlet is provided for the overflow water. This outlet is situated at the bottom of the dike and just above low water mark. The opening is a wooden sluice closed by a wooden clapper, which opens outward permitting the drainage water from the reclaimed marsh to escape. When the tidal water rushes in from the sea, the clapper is forced inward, and the opening is thus effectually closed. Such an outlet and the supporting timbers is called an aboideau, a word first used by the French Acadians of Evangeline Land.

The most common grasses found on the reclaimed marshes are timothy (Phleum pratense), couch (Agropyrum repens), red top (Agrostis alba), red clover (Trifolium pratense), alsike clover (Trifolium hybridum), white clover (Trifolium repens) with other plants and grasses.

Many of these Bay of Fundy diked marsh soils are extremely fertile and are not readily exhausted. The fertility is due to the great depth of the soil in combination with its homogeneity, its water holding capacity and filtration power given by the fineness of the soil. The problem has been, therefore, to eliminate the salt

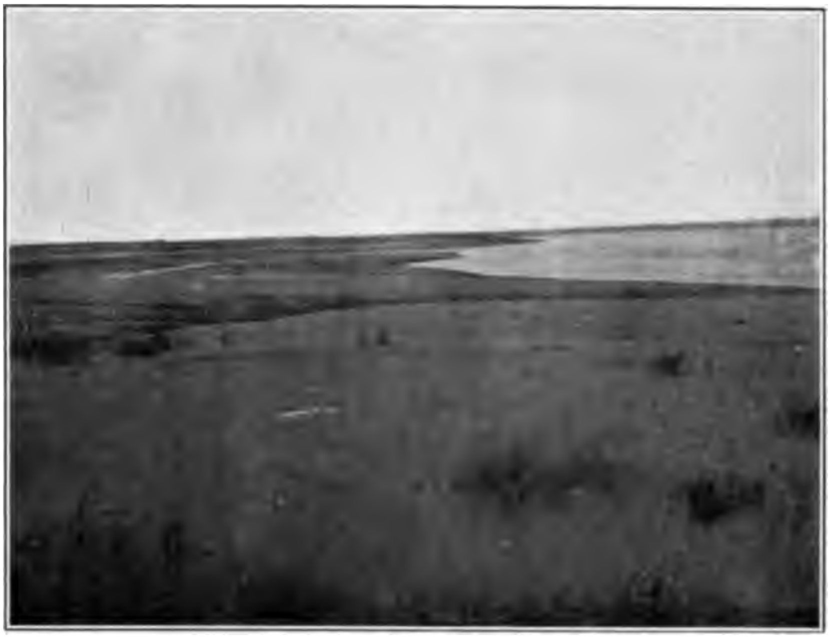

FIG. 1.—WILD SALT MARSH, GRAND PRE, NOVA SCOTIA.

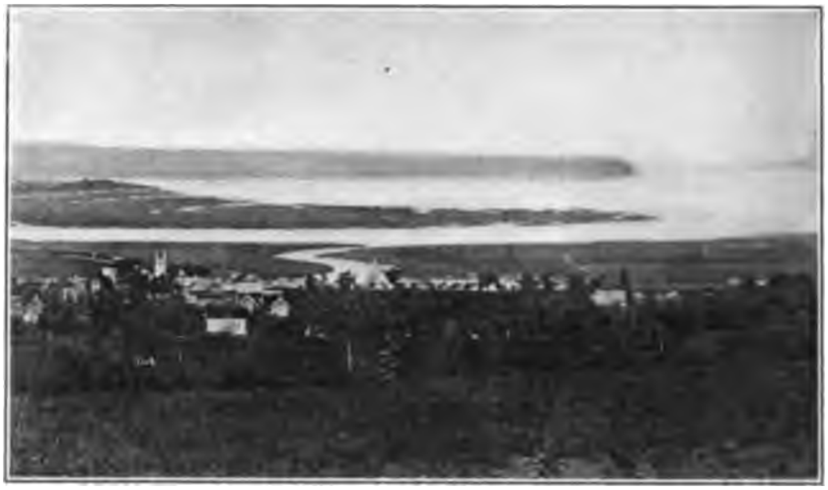

FIG. 2.—CAPE BLOMIDON. RECLAIMED MARSH IN THE FOREGROUND.

from the soil and this has been done most effectually by the scientific application of a system of drainage by which the soil is gradually washed free of all its injurious mineral salts.

The problems which confront the irrigation engineer in reclaiming the irrigable lands of the west and southwest are somewhat similar. These irrigable lands are either alkaline, or non-alkaline. If non-alkaline, the problems which confront the irrigator are comparatively simple, but where the soil is alkaline, serious difficulties are often encountered. The alkalinity of the soil which renders it unfit for ordinary cultivation is due in general to three different kinds of salts. The soils which contain black alkali (sal soda, sodium carbonate, Na_2 Co_3) are most unsatisfactory. Black alkali causes plants to blacken, become sickly and die. Saline alkali soils are those in which common salt (Sodium chloride), is found and these soils, therefore, are related to the soils of the salt marshes, where common salt is abundant. The white alkali soils are least objectionable, *i. e.*, when sodium sulphate (Glaubers salt, Na_2 So_4) is present. Vegetation, as before, is indicative of the character of the soil and by a study of such vegetation, the plant grower can determine what plants should be grown to prove profitable to the land, and yield a financial return. After carefully collecting and enumerating the plants met with on alkali soils, the botanists of California[*] found that most of them are confined strictly to those particular soils at least in a wild state. The following are the most characteristic alkali plants; sesuvium (Sesuvium portulacastrum), samphire (Salicornia ambigua), salt wort (Suaeda suffrutescens and S. Torreyana), Kochia (Kochia californica), yerba mansa (Anemopsis californica), nitrophila (Nitrophila occidentalis), tall tarweed (Centromadia pungens), salt bushes (species of Atriplex), alkali heath (Frankenia grandifolia campestris), tussock grass (Sporobolus airoides), salt grass (Distichlis spicata), bushy goldenrod (Bigelovia veneta), greasewood (Allenrolfea occidentalis), etc. It is a remarkable fact that at least 197 species of plants native to California are restricted to alkali soils. This is all the more remarkable when we remember the fact, that frequently the alkali content of the soil becomes greater with irrigation, because the alkali rises in such soils through capillary action, and thus kills out even robust native plants. But the structure of the alkali plants is what enables them to exist where other plants are destroyed. The anatomical structure of such plants is of a nature to facilitate the absorption of moisture and also to restrict the loss of such water by evaporation. One of the most interesting features of the alkali plains is the gregarious nature of the plants that grow upon them. Some plants are rare and local; others are found in distinct circumareas about an old lake basin. For example at Dry Lake near Rosamond on the Mohave Plateau, one finds in passing from the hills toward the dry lake bed, first a circumarea of tree yucca (Yucca brevifolia), next one of creosote bush (Larrea mexicana), both above alkali soil, and then in a succession of circumareas, species of salt bush, bushy goldenrod, salt wort, salt grass and tussock grass. We see, therefore, that the distribution of the plants of alkali valley bottoms is due to the physical and the chemical conditions of the soil, and that these plants may be used as indicators of soil conditions. Both the bushy goldenrod and scrub salt bush indicate a light, gravelly soil with compartively low alkali contents, chiefly composed of sulphates. The minimum of sulphates is lowest and the maximum highest in the scrub salt bush belt, but carbonates (black alkali) and chlorides are lowest in the bushy goldenrod belt. Samphire indicates a moist soil with excessive chlorides (common salt) and sulphates. Greasewood (Allenrolfea) grows only in moist soil where sulphates and common salt are heavy and carbonates are light. Saltwort (Suaeda) depends on heavy chlorides and heavier sulphates, with carbonates varying between 360 and 2,400 pounds to the acre.

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[*] Joseph Burtt Davy, Natural Vegetation of Alkali Lands. Partial report of work of the Agricultural experiment station of the University of California for the years 1895-1896, 1896-1897, pages 63-75.

The cultivated plants, suitable for alkali soils are mangel wurzel, quinoa, sac saoul (Haloxylon ammodendron) and salt bushes* (Atriplex semibaccata, A. leptocarpa, A. halimoides, A. nummularia, A. holocarpa, A. vesicaria, A. canescens, A. confertifolia, A. truncata), sunflower, Jerusalem artichoke, quitch grass, tussock grass, wild millet (Beckmannia erucaeformis) and others.

The reclamation of alkali soils, if irrigation is to be practiced may be accomplished in four ways, viz., by under drainage, by counteracting evaporation of water from the soil surface, by chemical treatment and by the growth of crops. There is abundant evidence that under drainage will reclaim these lands. The irrigation water which is conducted to the land percolates through the soil, and as in the salt marshes of the Bay of Fundy, the salts are washed out of the superficial layers of the soil into the drainage ditches, the water of which shows a large salt content. In fact, enormous results may be accomplished by a judicious system of drainage. Since evaporation of the soil moisture at the surface is what leaves the alkali salts deposited on the surface where the main injury to the plant occurs, it is obvious that evaporation should be prevented, as much as possible. Three methods for this purpose are practiced by farmers and gardeners, viz., shading, mulching and the maintenance of loose tilth, so as to break the capillary channels of upward water movement. The latter is accomplished by stirring the surface layer of soil by cultivation so as to form a dust mulch.

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*P. Beveridge Kennedy, Salt Bushes, U. S. Dept. Agriculture, Farmers' Bulletin No. 108 (1900).

In the application of chemical antidotes, it is apparent that of the three sodium salts. (sodium sulphate, sodium chloride, sodium carbonate) which usually constitute the bulk of alkali, only the carbonate of soda can be materially changed by chemical agents applied to the land. The sodium salt least injurious to vegetation is the sulphate, commonly called Glauber's salt and which forms the chief ingredient of white alkali. Sodium carbonate, or black alkali, even in small amounts renders a soil uncultivable. This is notably true of the great forage crop of the arid region, alfalfa or lucern. Its seed is extremely sensitive to black alkali, and will decay in the soil unless protected against it. Gypsum (land plaster, calcium sulphate) is the cheap and effective agent in bringing this transformation from black alkali to the comparatively harmless white alakli, provided water is present. The change takes place as illustrated in the accompaying chemical formula:

$$\underset{\text{Gypsum}}{Ca\,So_4} + \underset{\text{Black Alkali}}{Na_2\,Co_3} = \underset{\text{Calcium Carbonate}}{Ca\,Co_3} + \underset{\text{White Alkali}}{Na_2\,So_4}$$

The effect of gypsum on black alkali land is often very striking to the eye. The blackish puddles and spots of such land disappear, because the gypsum renders the dissolved humus insoluble and thus restores it to the soil. The latter soon loses its hard puddled condition and crumbles into a loose mass into which water soaks freely.

Another method for diminishing the amount of alkali in the soil is the growing of plants that take up considerable amounts of these salts. In Egypt this method has been long in practice. There has been done probably more work in the reclamation of alkali and salt lands in Egypt than in any other country. The soils are first washed by irrigation water. As during much of this time, the land is flooded to a depth of at least four inches, it is necessary to grow such crops as will live with their roots in standing water. The most important crops in use in Egypt are rice, barnyard grass generally known as dineba (Panicum crus-galli), a reed called samar (Cyperus laevigatus) and a small loose headed variety of sorghum (Sorghum saccharatum). If the condition of the soil after the first flooding appears to warrant the step, the land is plowed and a test crop of dineba is sown broadcast, generally about July first. If a stand is obtained, the land is considered fit for berseem* (Trifolium alexandrinum), the great forage and soiling crop of the Nile Valley, which is sown at the beginning of autumn immediately after the harrowing and the second flooding, which follow the removal of the dineba. If the growth of berseem is successful, it is considered sufficient evidence that the land is ready for cotton, which is planted the following spring. The transition from a bare, salty lake bed to productive cotton fields generally requires about three years under this treatment. Similar methods are adopted if sorghum or samar are used in this reclamation.

The reclamation of arid, non-alkaline irrigable lands is vastly simpler than in regions where alkali occurs in the soil. Such soils require a sufficient amount of water to produce large returns. Two sources commonly supply the water of irrigation. In many parts of the arid west, artesian wells are sunk and a supply of water is thus obtained sufficient to irrigate a large farm. Where rivers, or large lakes occur, these are utilized by the construction of dams, reservoirs, open ditches, pipe lines and flumes. Mountains must be tunnelled, trestles constructed across valleys to conduct the impounded water to the place of consumption.

Having described the reclamation of alkali and non-alkali lands that are capable of irrigation, it remains to describe the system of agriculture where the climate is arid, but where irrigation cannot be practiced. Dry farming is the term applied to the cultivation of

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*David G. Fairchild, Berseem, U. S. Dept. Agriculture, Bureau of Plant Industry, Bulletin No. 23 (1902).

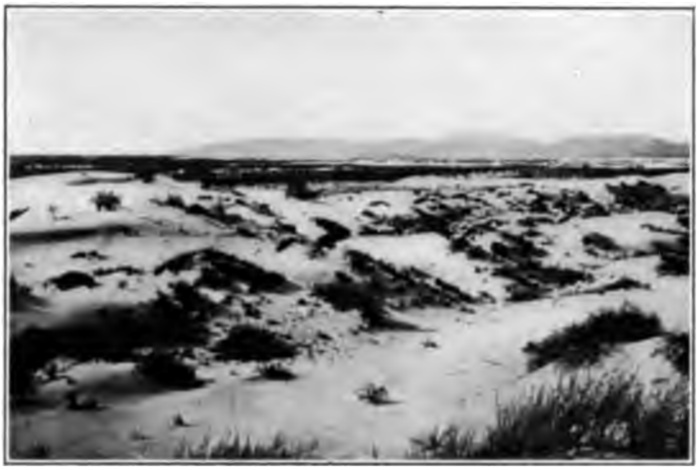

FIG. 3.—WHITE SANDS IN THE TULAROSA DESERT, NEW MEXICO.

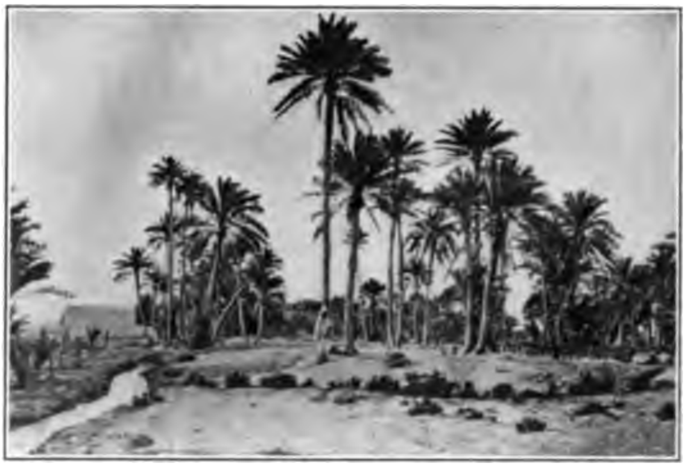

FIG. 4.—BORDER OF THE OASIS AT BISKRA.

plants in our arid climate, where the soil owing to the absence of abundant rain and large rivers is not capable of irrigation. The term dry farming is a misnomer, since crops cannot be grown without water, but the meaning of the term, as popularly used, is the practice of farming with less than a normal amount of water. As a rule, where dry farming is practiced, the annual rainfall ranges from eight to twenty inches. There are vast semi-arid areas in the west, which cannot be brought under irrigation, and this method of farming is an attempt to utilize some of these lands for other agricultural purposes than mere grazing.

The Utah Experiment Station points out that there are two main problems in dry farming, (1) the absorption and retention of moisture by the soil and (2) the culture of crops, which make a satisfactory growth and reach maturity with very little water. If these principles are fundamental in dry farming, it follows that no water, whether rain or snow, should be allowed to run off the farm lands. It is obvious that in order to store the rain water in the soils, room must be provided for it by the separation of the soil particles, so as to leave spaces for the water between them. Deep plowing then is important in the formation of a storage reservoir which catches the water that falls in the torrential rains common to the semi-arid regions of North America. The snowfall may be conserved by means of wind breaks, that in the first place, help collect the snow, and in the second place prevent the winds from evaporating the snow before it has time to melt and to work into the soil. By means of late fall plowing, so that deep ridges and furrows are formed, the snowfall may be retained for a considerable period of time, especially if the ridges are placed transverse to the prevailing direction of the wind. Once the snow, or rain water percolates into the soil it is important to conserve it, as far as possible, for the growing crops. This is accomplished by thorough surface tillage, which by breaking the capillaries of the soil prevents the rapid evaporation of the water from the soil, and secondly, by adding humus to the soil, either as manure, stubble or litter.

One of the most interesting systems of agriculture without irrigation is found in the region of the Erg in the great desert of northern Africa.* It is a land of enormous sand hills, some of which reach a height of 500 feet. Oued Souf is in the heart of the Erg. Here, as far as the eye can reach, it rests upon an expanse of pure sand, raised into range after range of dunes. In the hollows among the dunes are gardens of date palms, sometimes mere pockets containing ten or twenty trees, sometimes larger basins in which are groves of fifty to one hundred palms. Among these dunes the Arabs have dug down to the ground water level, where they have planted date palms. As rapidly as the sand is blown into the hollows, it is carried out by the Arabs in baskets to the top of the dunes and dumped on the outer slope. Ideal conditions are thus supplied to the date palm, which thrives best when its roots have abundant moisture and when its crown of leaves is in the blazing hot sun of a desert climate. Not only do these favorable conditions occur in the Souf, but the reflection and glare of the sun from the slopes of the sand hills materially increases the temperature of the air surrounding the crown of the tree. This kind of irrigation by ground water alone is perhaps the most interesting kind that has come to the attention of the writer.

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*Thomas H. Kearney, Agriculture Without Irrigation in the Sahara Desert, U. S. Dept. Agriculture Bureau of Plant Industry, Bulletin No. 86 (1905).

The cultivation of the maguey, or century plant (Agave americana) on the table land of Mexico illustrates another kind of dry farming. The larger plants from which aguamiel, or honey water is obtained for pulqué manufacture, produce a considerable number of stoloniferous offsets. These are severed from the parent plant and are set out in rows in recently plowed fields. Above each plant is dug a shallow crescent-shaped ditch which acts as a reservoir in conserving all of the moisture which as rain falls on these semiarid soils. A modification of this system is one practiced by the Pueblo Indians, who learned the method from their ancestors. When corn, beans and other crops are grown by these sedentary agricultural Indians, the seeds are planted some distance apart. The growth of the plant is watched, and around the base of the stems in each case, stones, sticks and other litter are heaped, so that the soil moisture may be conserved, and so that the occasional thunder showers may benefit the growing crop. Many of the religious rites and ceremonies of these Indians is associated with prayers to the Great Spirit for such rains to aid the growth of the corn and bean plants. The method of stirring the surface soil, so as to form a dust mulch, was also known and utilized by the Indians of Mexico, and of the southwest, who employed a pointed stick for the purpose.

Notwithstanding the fact that the dry farming was practiced anciently by the American Indians, the system as practiced in the United States is largely due to Mr. H. W. Campbell, a native of Vermont, now residing in Lincoln, Nebraska. The expression "Campbell System" is much used because the gentlemen above-mentioned was eminently successful in demonstrating that deep plowing, adequate surface tillage, and proper care of details would enable the western farmer to grow various crops with considerably less rain, or snowfall than had been in former years thought possible. The dry farms should have a larger acreage than either the irrigated, or the humid farm. There should be land enough to provide summer pasturage for stock. With live stock as a foundation and with alfalfa, vegetables and fruit grown by what irrigation can be practiced, the dry-farmed land will insure large crops in wet years and provide against the total loss of the crops in years of drought. This has been the lesson which was taught the people of western Kansas, Nebraska and eastern Colorado, when the fat years of the first settlement were followed by lean years that ended with failure and poverty. It was then that men lost hope through repeated bitter failures, and thriving towns were deserted.

As before emphasized, the growth of crops that thrive well under semi-arid condition must be studied, if any system of dry farming is to be eminently successful. The crops which have been found to adapt themselves best to these semi-arid conditions are the durum wheat, Kafir corn, sorghum, alfalfa, corn and emmer.

The macaroni or durum wheat (Triticum durum) is grown commercially in Spain, Italy, Algeria, India and Russia. The United States and Canada until recently grew only small amounts. In 1899 the United States Department of Agriculture sent Mr. M. A. Carleton to Europe and to Asiatic Russia to obtain all possible information in regard to the macaroni wheats and to select such varieties as would probably succeed in the Great Plains region and especially in the semi-arid portions. Mr. Carleton made a very thorough exploration of the wheat growing districts of the old world, and secured a large number of varieties of the durum wheats, such as the Kubanka, Velvet Don and the Yellow Gharnovka. These wheats, the department distributed to growers in suitable localities through the semi-arid west. As a result, the production of these wheats since their introduction, has increased with astonishing rapidity. The estimated crop of the two Dakotas alone, during the season of 1903, was 10,500,000 bushels. All of these durum wheats are good spring sorts and are adapted to very dry climates. Not only has the introduction of these wheats enabled a large territory to be utilized by agriculturists, but it has also stimulated the manufacture of these wheats into various edible pastes (patês alimentaires), macaroni and a hundred other different forms[*]

Kafir corn is perhaps the surest fodder crop in dry farming. The plant stands drought well and responds to rain at any time before it is killed by frost, or a dry soil. Sorghums withstand drought well and are valuable stuffs for semi-arid and humid sections of the country. Alfalfa is one of the most valuable forage plants for arid climates, if sufficient moisture can be secured to sustain the plant until it is well started. Its enormous top root enables it later to become more or less independent of the superficial soil moisture, and it yields large crops of abundant and nutritious forage. It grows well only on drained soils. Emmer is a grain plant for the semi-arid regions, introduced into the Dakotas from Russia by the German-Russian farmers, and is useful as a valuable and regular crop for stock feeding. Botanically emmer is a species of wheat (Triticum dicoccum). The plants are pithy, or hollow stemmed; the leaves are sometimes rather broad and usually velvety hairy; the heads are almost always bearded, very compact and much flattened on the two-rowed sides. The grain is somewhat similar to spelt, but is usually harder, more compressed at the sides and redder. Emmer is a much more hardy plant than spelt, resisting drought and leaf rust. Fall sown varieties are winter hardy. Such are a few of the plants that are adapted to the dry climate of some section of our western states.

The United States Department of Agriculture has searched the world for drought-resistant crops and in conjuction with several state experiment stations, extended experiments have been conducted to determine their value in this country. Independent investigators have been working many years to adapt old varieties to semi-arid conditions. Tools have been invented for cultivating the soil, so as to check evaporation, and investigations are now being made to perfect these tools and methods. The successful application of agricultural methods adapted to the semi-arid region will open to permanent settlement millions of acres of land which under ordinary methods of cultivation would be useful only for pasturage.

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[*] M. A. Carleton, Macaroni Wheats, Bureau of Plant Industry, Bulletin No. 3 (1901); Carl S. Schofield, The Algerian Durum Wheats, Bureau of Plant Industry Bulletin No. 7 (1902); James H. Shepard, Macaroni Wheats, Year Book, Department of Agriculture (1903) 329; M. A. Carleton and J. S. Chamberlain, The Commercial Status of Durum Wheats, Bureau of Plant Industry, Bulletin No. 70 (1904); Robert C. Skinner, Manufacture of Semolina and Macaroni, Bulletin No. 20 (1902).

There is a phase of the subject of this paper which has not been alluded to and that is the problem of forest preservation and perpetuation. The preservation of the forests in the mountainous regions of our country is absolutely essential, if a rational system of reclamation is to be developed. Such forests conserve the rain that falls, and the snow of winter collects under the trees and melts slowly enough so as to prevent a disastrous run off. The safety of irrigation ditches, reservoirs and dams is connected with the preservation of the forest. This important fact has been very clearly recognized and several presidents have by proclamation set aside mountain forests as national reservations to be held by the government in perpetuity.

The arid west, therefore, is destined to support a vast population of home builders and agricultural workers, but it seems to the writer that it is bound to develop along different lines from the rest of America, as the population of our salt marsh districts is different from the inland farming class of the country. This local differentiation of population is objectionable, but perhaps, our rapid means of transportation will keep to a minimum such local differences of race and customs. These are some of the problems that press upon us and future generations of Americans for solution.

PETROLEUM AND MINOR MINERAL PRODUCTS IN PENNSYLVANIA

By Walter S. Tower.

Petroleum, meaning literally "rock oil," is included in the group of natural products known as bitumens, along with natural gas and asphalt. Bitumens, as a class, are technically known to chemists as hydro-carbons, since they are made up principally of hydrogen and carbon in the ratio of about fifteen per cent of the former to eighty-five per cent of the latter.

Although the common use of petroleum is comparatively recent in this country, dating back less than fifty years, bitumens have been known and applied to the uses of man since the earliest historical times. In some of the oldest structures in Egypt, as well as in Babylon and Nineveh, a semifluid bitumen appears to have been used as a cement for bricks and slabs of alabaster. In this country petroleum was certainly known before the advent of the white man. The Indians were found to use it for various medicinal purposes, and throughout the Pennsylvania oil regions the earliest settlers found large square pits, often several feet deep, dug around the "oil springs," apparently for the purpose of collecting the oil on the surface of the water. What people built these pits has always remained a mystery. They almost certainly antedated the French, and among the Indians of the region there is said to have been no tradition of their use.

Historical references to the discovery and use of petroleum are found soon after the arrival of the first colonists. All through the early days of development the presence of the oil was known to the settlers, by whom small amounts of it were skimmed from the springs or creeks either for home use or for sale as Seneca or America oil, then regarded as a cure for all ills. In drilling wells for salt brine, during early colonial days, quantities of petroleum filled the wells, spoiling the brine, and consequently its presence was looked upon as a nuisance by the salt-makers. All this time it was known that the oil would burn because of its use by the Indians in some of their ceremonies.

Toward the middle of the last century paraffine oils made from coal had appeared as rivals of sperm and whale oil for illuminating purposes. It was soon discovered that the paraffine oils, as they were called, could be made more easily from petroleum than from coal. This discovery led at once to the idea of securing a greater supply of petroleum than it was possible to obtain from the skimming of pits and creeks. The experience in the old brine wells furnished the hint, and the first oil well was drilled in 1859 on the flats of Oil Creek, in Venango County, Pennsylvania. It was known as the Drake well, and had a depth of sixty-nine feet. With a daily production of twenty-five barrels, it marked the real beginning of the great oil industry of Pennsylvania, and of the United States: an industry in which this state was to lead the country for many years, an industry which in all its branches now gives employment to many thousands of people and yields an annual revenue of millions of dollars.

The growth of this industry was rapid from the completion of the first well. Not only were new fields discovered in Pennsylvania, but they also were found to extend into the neighboring states, New York, Ohio and West Virginia. The "oil boom" was tremendous. Attempts have been made to "strike oil" in almost every part of the country, with the result that other valuable fields have been discovered; but many hundreds of thousand of dollars have been sunk in drilling worthless wells. Even now there are periodic ripples of excitement over supposed discoveries in places which never have been, and never could be, oil producers.

For more than a decade Pennsylvania, together with the relatively small extension into New York, continued to be the sole producing area of the country. At the end of that time the annual yield had passed the 10,000,000 barrels mark. Then came the discovery of the Ohio and West Virginia fields about 1876. California, Indiana, Kansas, Texas and Louisana follow along in order, the opening of the enormous pools of Texas and California being of very recent date. Up to 1893 the Pennsylvania-New York field continued to yield more than half of the total product of the country. Three years later, however, Ohio wrested the first rank from Pennsylvania, which has now (1905) dropped back into seventh place, surpassed in amount of yield by the California, Texas, Ohio, Kansas-Oklahoma, West Virginia and Indiana fields. The output in 1905 was only 10,437,000 barrels (of forty-two gallons each), less than one-third the output in 1891, the year of greatest production. But in value of the product Pennsylvania is exceeded only by Ohio and West Virginia. The California fields in 1905 yielded more than the Pennsylvania fields ever did, and the Texas field is not far behind; but in both these areas the quality of the oil is distinctly inferior for refining purposes.

In the early days of the oil industry it was believed that there was some connection between the depressions of the surface, represented by the river valleys, and the accumulations of oil below. All the first wells were drilled on the flats along the various streams. The success of "wild cat" wells drilled on the hill sides disproved this theory. Next came the idea that the oil was stored up in numerous crevices and pockets in the rocks, and that the size of the particular pocket determined the yield of the well. Careful records of drilling, however, showed no signs of the drill dropping into opening in the rocks, but they did show that the arrangement of the rock formations was an important factor in oil production.

The study of the well records showed that every oil field contained three important rock elements, a source, a reservoir and a cover. Sources have been found in almost every kind of rock, but most of the large supplies have come from limestone and shale or slate formations. In other words, the source is usually a fine textured rock in which great quantities of organic life, both animal and vegetable, have been stored, and by processes of decomposition and chemical changes have been transformed into oil. In the formation of petroleum, therefore, there is no necessary connection, or even association, with coal deposits, hence the popular term "coal oil" is a misnomer and misleading. Sometimes, as in limestones, the oil is stored in the porous parts of the rock from which it comes; in others, as in slates, it usually collects in overlying coarse porous sandstones, or "oil sands" as they are called. In either case, the more porous the rock, with the same thickness, the greater the supply of oil stored up. Whether the source and the storage reservoir are the same or different strata, the cover is always a fine grained layer of shale, of varying thickness, which, by its imperious nature, prevents the escape of the oil to the surface, or its dissemination throughout the overlying rock series. In formations which have been greatly disturbed from a horizontal position by geologic forces, oil wells are not common. Some of the fields, however, seem to depend on the accumulation of oil beneath the roofs of broad gentle arches in the strata.

The significance of these essential elements may be seen from a calculation made of the amount of oil in some of non-producing rocks of the present time. A formation of wide extent over western Pennsylvania, and New York and eastern Ohio has a very uniform petroleum content, estimated at not less than one-tenth of one per cent. The average thickness of the formation is about 500 feet, which means, by volume, 2,500,000 barrels of oil per square mile. The total production of the whole country up to the end of 1905 was over one and a half billion barrels. Yet to duplicate that immense amount from this one formation alone, would require only about 600 square miles, or an area less than that of Venango county. Vast as the aggregate amount must be in all the oil bearing strata, by far the greater part of it is minutely diffused through the rocks, unavailable and worthless.

The process of drilling consists mainly in keeping the drill running day and night until the "oil sand" is reached. The string of tools used is generally about sixty to seventy feet long weighing a ton or more. The tools are so constructed, by means of the "jars," a slotted section, that as the string is alternately raised and let fall, the upper part delivers an upward blow to loosen the drill from the rock, while the heavier lower part delivers the downward, cutting blow. The depth of the well depends on the depth of the "oil sands" below the surface. The original Drake well was sixty-nine feet deep, whereas some recent wells have been sunk to a depth of 3,500 to 4,000 feet. The cost of the well depends, of course, on the depth and on the character of the rock, whether hard or soft. The average cost of the Pennsylvania wells has been calculated as very close to $2,000 each, while some of the Ohio wells cost less than $300.

Oil wells are of two sorts, flowing wells or "gushers," and pumping wells. In the former the pressure from the reservoir is great enough to make the oil overflow at the surface—often with sufficient force to cause a jet of oil to rise many feet into the air.

In the latter the pressure is less, causing the oil to rise only part way to the surface and making pumping necessary. Wells which begin as gushers usually, after a time, require pumping until the supply ceases entirely. On the basis of long records from the Pennsylvania field, it has been estimated that the average duration of profitable production from a well is about five years. In individual cases, however, the calculation is of little value, for the nearer the wells are placed on a given property the sooner they give out. This is accounted for by a flow of the oil laterally through the rock, a fact which has been shown by the movement of colored dyes from one well to another. It it therefore manifestly impossible for the owner of a small oil property to preserve his supply beneath the surface. He must drill and produce, whether with profit or at a loss, or his neighbors will drain the whole supply.

The greatest yield of the well almost always comes at first. When the supply begins to fall off, various devices are employed to increase production to the point of profitable operation. The nitro-gycerine "torpedo" or "shooting" of wells is one of the most familiar devices. The so-called "gas pump," to create a partial vacuum, has also been used, but neither of these ways is permanently effective. In some localities where the oil is of high grade, but the yield is small a number of wells are pumped by the multiple pump method. In one form, an engine is coupled to a circular table in such a way that the table makes a partial revolution and then returns to its former position. To the circumferance of the table a number of connections are made, often by wooden rods, in such a way that each connection is given the same amount of stroke by the revolution of the table, and this stroke is sufficient to work a pump in each well on the circuit. This simple form is practicable only in fairly level areas. In the hilly districts, especially in West Virginia, electricty has been used to operate pumps, as high as 200 wells being worked from a single motor. In this way it is possible to pump many wells which could not be operated separately without loss.

The amount of oil produced by the oil fields of the state, since the beginning of the industry, can be realized only in a comparative way. In actual quantity it has been, in round numbers, 665,000,000 barrels, or a little less than half the total output of the whole country to the end of 1905. Some idea of what these figures mean may be gained from the fact that if all the oil produced by Pennsylvania wells were collected in one basin, it would make a lake two miles wide, two miles long and everywhere over thirty feet deep. Or if put into separate barrels, each of which measured two and a half feet high, the barrels placed end to end would encircle the earth one and a quarter times.

All the Pennsylvania oil fields are located in the western part of the state. The oldest field is the one along the course of Oil Creek, in Venango County, where the original wells were drilled. The area of oil districts ranges in a northeast-southwest direction from the Venango County field, through Forest, Warren, and McKean counties, across the New York State line. South from Venango there is an extensive area in Clarion and eastern Butler counties which has recently gained new prominence by the development of gusher wells in a region which has been producing for many years and where gushers were never before found. There are also separate fields in Beaver, Washington and Allegheny, counties farther to the northwest.

The geographical location of the oil fields, in the less easily accessible parts of the state, and away from the largest markets for their products, has been the cause of important changes in the methods of transporting the crude oil from the wells to the refineries and to the markets. During the days of Seneca oil, bottles and barrels were used for the small amounts gathered. Even after the first wells were drilled, the oil for several years was put up in barrels and most of it was hauled in wagons to the creeks of the region, down which it was floated on rafts to the Allegheny and thence to the refineries at Pittsburg. The expense of handling and the loss of oil through the use of barrels, soon led (1866) to the adoption of "bulk" barges, river boats fitted with large tanks, in which the oil was shipped in bulk. About the same time the bulk plan of shipment was applied to shipments by rail, and the first tank cars were invented—then nothing more than two wooden tub-like tanks mounted on an ordinary flat car. A few years later the wooden tank cars were replaced by the boiler iron cylinder cars as they appear to-day, the advantage being not only greater capacity, but also greater safety and strength. The evolution of the bulk barge led to its application to ocean-going vessels. Hardly anyone believed that the latter venture would ever prove practicable, but at the present time a large part of the exports are made in bulk in steamers carrying from one and a half to two million gallons. Where it formerly took from two to four weeks to load a vessel carying half that amount in barrels, the modern vessel can be loaded in two or three days.

The rapid increase in production in the '70's, and the difficulties of transportation in some of the regions, led to the development of pipe lines by which the oil was at first pumped to local shipping stations. The pipe lines were soon extended from the wells to the refineries, almost entirely supplanting the bulk barges and tank cars in the transportation of crude oil. The extension of pipe lines was further stimulated by the growth of the export trade and by the transfer of the chief refineries, from positions near the oil fields, to their present locations at Bayonne, N. J., Philadelphia, Baltimore and Marcus Hook, Pa. At the present time practically all the crude oil is carried from the eastern fields, both in Pennsylvania and in the adjoining states, to the refineries by the large pipes of the "trunk" lines into which the smaller pipes from individual wells converge. In other words, the oil makes a practically uninterrupted passage from the well through a continuous line of pipes to the refinery three or four hundred miles away. The friction of the thick, crude oil in the pipes is enormous, and to force the oil through the pipes, across the hills and over the mountain ridges lying between the oil fields and the seaboard, necessitates relay pumping stations, with powerful pumps, at intervals of forty to fifty miles.

The discovery of oil in western Pennsylvania created a great boom, with an inrush of armies of speculators, mechanics, laborers and all sorts. In fact, much of western Pennsylvania owes its original development to the stimulus of the oil fields. McKean County affords one of the most striking examples of the growth of population. In 1810, when the county was organized, the total population was only 142; and up to 1870 it had increased only to 8,825. Between 1870 and 1880 the Bradford oil field was developed, and in that decade the population increased nearly five-fold. In Venango County the oil wells were developed most rapidly in the decade between 1860 and 1870; at the same time the population nearly doubled. The field reached its maximum of production in 1869 and then gradually declined. This was also reflected in a decrease of 1,070 in the population. Forest County, containing a part of the Warren field, had a population of only 900 in 1860. Oil was discovered in the region and in ten years the population numbered 4,000. The extent to which the oil boom took possession of the people is shown by a note made in 1885 by a member of the State Geological Survey, which says: "The value which has been attached to most of Forest County lands, as actual or prospective oil territory, exceeds so greatly their possible value for coal mining, under the most favored conditions, that many of the more recent residents in the county and owners of its lands are not even aware of the fact that any coal beds occur under its surface, or that there is the most remote possibility of coal ever being found."

Cities sprang up, and with the failure of the wells they were quickly deserted. Pithole City, in Venango County, had a population of over 10,000, and in 1865 it was next to Philadelphia the largest postoffice in the state. By 1880 there remained only a score of houses, fallen in decay, with hardly a single inhabitant. Corn fields cover the sites of some of the famous wells, and others have been invaded by the forest. To-day the name exisits only in the history of the oil fields.

Pennsylvania has already passed its greatest importance as an oil-producing state. During the last fifteen years the annual yield has steadily declined as well after well has gone dry, and whole fields have ceased to yield profitable quantities. At the same time thousands of new wells have been drilled each year. In 1905, for example, upwards of 3,700 new wells were drilled in Pennsylvania and New York. Over a fifth of these yielded nothing; of the others the initial daily production was over 12,000 barrels. Yet this quantity was not sufficient to overcome the decline of the old wells, and the total annual yield fell off by over 600,00 barrels from that of the previous year. Occasionally there is recorded a new strike in one of the old localities, and the decaying oil towns have temporary visions of returning greatness. But the visions are fleeting. The fate of Pithole City is the fate awaiting many a town and village whose foundations are laid on the "oil sands." The time is not far distant when the whole industry, as far as this state is concerned, must sink into insignificance. Once the reservoirs are exhausted they can never be replenished; and exhaustion of the reservoirs is inevitable as long as the demand for oil continues to increase at the present rate.

Cement.

During the construction of the Lehigh Canal from Easton to Mauch Chunk, the excavations uncovered the cement rocks which have since been used in such enormous quantities. The burning of the rock for cement manufacture was begun at Siegfried, and out of a very primitive beginning has grown the present great industry in the making of Portland and natural rock cement. Both these products are hydraulic cements, as they are called, or cements which possess the quality of hardening under water. Natural rock cement is made by burning an impure limestone at a comparatively low temperature. The best stone is a limestone with clay as an impurity, with certain proportions of lime, silicia and alumina. After burning, the resulting clinker is ground into powder form ready for use or for shipment. The Portland, or artificial, cement is made by grinding some form of carbonate of lime and clay to a coarse grit. These are mixed in the proper proportion and are then burned at a high temperature in the same way as in the manufacture of natural rock cement. The cement industry in Pennsylvania is confined mainly to the manufacture of Portland cement. In the production of this commodity the state ranks far ahead of all others, with nearly three-sevenths the total output of the country, and over three times the quantity produced by any other state. The cement factories are located almost exclusively in the limestone areas in Lehigh and Northampton counties. In these two counties fifteen establishments turn out thirty-nine per cent of the total product of the country. The industry has give the name to one town, Cementon, on the Lehigh. Coplay and Catasauqua are the other centers of the industry.

The supply of materials for cement-making is practically unlimited. In fact, so widely distributed are the raw materials that in case of necessity there is hardly a county in the United States which could not produce cement. The industry is peculiar, however, in that it naturally leads to a combination of interests rather than to the operation of a large number of independent factories. The erection of a cement plant involves an expense too great for an individual or a small firm to assume. The land, plant and working capital for an establishment producing 2,000 barrels a day requires an investment of between $1,000,000 and $1,500,000. The industry, therefore, is naturally concentrated and is likely to become even more so in the future. Thus there is little prospect of the preeminence of Pennsylvania being assumed by any rival state. On the contrary, with the increased use of cement as a building material —the production increased threefold, from 12,000,000 to over 35,000,000 barrels, in the five years 1901 to 1905—the industry must become constantly more important to the state.

Clay Products.

Anyone visiting Philadelphia for the first time is struck by the prevalence red brick buildings. Blocks after blocks of solid red walls, varied here and there by an occasional brown or green stone front or by white marble steps and window sills, line the streets on every side. The explanation lies partly in the fact that for over two hundred years Philadelphia has been the leading brick-making city in the country. A large part of the city is underlain by beds of brick clays of superior quality. With the abundance of raw material close at hand, bricks have been cheap; being more durable than wood and, giving a certain substantial air to the buildings—they have made the homes, factories and business blocks for this most delightful of American cities. It is commonly believed that the predominance of brick buildings has been the secret of no disastrous conflagrations such as swept Boston and Chicago.

Not only Philadelphia, but also the whole extent of southeastern Pennsylvania is abundantly supplied with brick-making material, valuable deposits of alluvial and residual clays being found in every county. The alluvial clays are best represented by the Philadelphia deposits, with their southward extension into Delaware County. These clays are deposits presumably made by the Delaware river at some former period in its history. The residual clays of the higher land are the result of long continued disintegration and decomposition of the surface rocks. In the Chester Valley clay deposits have been formed from the gradual dissolving away of the limestone, leaving behind the insoluble clay impurities. In the red sandstone belt, clay shale layers occur in plentiful quantities in a broad area, extending northeast and southwest across the state. Norristown, Pottstown and Perkiomen Junction are notable places at which these clays have been used. This shale clay makes not only building bricks of quality superior to that of the softer alluvial and residual clays, but it also possesses the property of making excellent vitrified bricks both for building and for paving purposes.

Closely analogous to the clay deposits are the kaolin beds in Delaware and Chester counties. The kaolin is the product from the decomposition or rocks rich in alumina—mainly feldspathic rocks. One of the largest deposits is near Kaolin postoffice, south of Avondale in Chester County. Here eighty to a hundred tons have been produced daily, most of the kaolin going to the potteries at East Liverpool, Ohio, or at Trenton. Other deposits which have been worked, occur along the same belt of feldspathic rocks, at Avondale and Glen Loch in Chester County; at Brandywine Summit, in Delaware County; and at Hockessin, across the line in Delaware.

An ingenious, as well as unique, use of the clay deposits was exposed in Monroe County a few decades ago. The crest of a sandstone ridge there contained a deposit of almost pure white siliceous clay. This clay was mined, treated with water until there was left only a residue of impalpable powder, which was then pressed into cakes and sold as soap.

In the South Mountain, the Great Valley and through the central part of the state, there are many deposits of residual clays of commercial value. Light colored or white clays are not uncommon, having been derived from light-colored shale layers in the other formations. This white variety has been used extensively in paper-making, for white tiles, ornamental and enameled brick, and also in the manufacture of calcimine. The white clay deposits have been developed largely in the region about Mount Holly Springs, in Cumberland County; Mertztown, Berks County, and Ore Hill, Huntingdon County; though many other deposits occur in the same general area. The less valuable varieties, used for common building bricks, are chiefly residual deposits from the decomposition of shales and impure limestones. Small amounts of alluvial clays are obtainable along the river valleys. Where it does occur, the alluvial deposit is preferable to all others, because of less expense and greater ease in preparing it for use. Allentown, Reading, York, Lancaster, Bethlehem and Harrisburg are all important centers of brick manufacture.

The clay-working industries of western Pennsylvania are hardly comparable with the great coal, and the iron and steel industries of the same region; yet they have already reached an important development, and are capable of vast expansion through a greater utilization of the unlimited supply of raw material. In this district, the clays are of two sorts; the alluvial deposits from the terraces along the Ohio and its tributaries; and the so-called fire clays from the coal measures. The former are naturally somewhat restricted in their extent, while the latter are widely distributed. One bed of fire clay associated with what is known as the Kittanning coal seam occurs over wide areas in Pennsylvania, supplies large quantities of material for the clay industries of eastern Ohio, and extends southward into Kentucky. The principal use of the terrace clays is in the manufacture of ordinary building brick, the chief centers being New Geneva, New Brighton, Connellsville and Monongahela City. These deposits are more easily worked, but they are of less commercial importance. The fire clay is of much more general distribution, and is adaptable to a variety of uses, such as, fire brick, high grades of building brick, pottery, tiles, drain and sewer pipes, paving bricks, etc. The main centers of the fire brick industry are in the vicinity of Pittsburg, New Brighton and Beaver Falls. Here the demands of the coke, iron and steel and glass industries create a large local demand for a major part of the product.

In the total value of clay products Pennsylvania ranks second only to Ohio. Fire brick is the typical Pennsylvania product, this state manufacturing approximately one-half the fire brick in the country. This phase, together with the making of building brick, make up about two-thirds of the total value of clay products for the state. They also represent to a large degree the two main clay-working sections of the state. Building bricks are the largest product of the establishments in the southeastern counties; and fire bricks are the chief product of the Pittsburg region, where the great local industries consume immense quantities of refractory furnace materials

Feldspar.

Pennsylvania is one of the few states in the country which produces feldspar in commercial quantities. The feldspar is obtained from the pegmatite veins, the disintegration of which gave the kaolin deposits. As the pegmatites are limited in occurrence to the southeast corner of the state, the feldspar works are not widely distributed. Practically all the quarries operated at the present time are in Delaware and Chester counties. The largest works in the state are located at Elan, Delaware County; other establishments are at Chester Heights, Glen Mills, Chelsea, Avondale, Chatham, Chadd's Ford and Unionville. Most of the feldspar is ground either at the quarries or at the factories for use as an abrasive material, in the manufacture of pottery or in glassmaking.

Flint.

The substance known to potters as flint is not true flint, in the sense of siliceous concretions in limestones, but it is always some more common form of the mineral quartz. The quartz for use as flint is obtained in a variety of ways. The koalin works at Kaolin, Chester County, have practiced the custom of saving the quartz grains which are washed from the kaolin, the material then being sold for potters' flint. At other places the quartz is quarried directly from the original veins, as at Oxford and at Columbia on the Susquehanna River. The largest quartz quarries are near the Juniata River below Huntingdon, where it is obtained from the sandstone—though most of this product is used in glass-making. Pennsylvania produces almost all of the flint used in the manufacture of china and high-grade pottery. But the demand for this purpose is gradually declining. The potters prefer ground silica sand as it is usually more free from iron than is the vein quartz.

Glass Sand.

There are great outcrops of pure quartzose sandstone in many of the ridges and hillsides of the central part of Pennsylvania. The disintegration of these quartzites has given many valuable accumulations of high-grade, white sands. In the western part of the state, also, in certain abandoned channels along the Monongahela and Youghiogheny, as at New Geneva, Bellevernon and Perryopolis, deposits of sand fill the old bed of the stream. Through the developments of these deposits, Pennsylvania has gained first rank as a producer of sand and gravel, the value of the annual output representing about one-fifth the total for the United States. From the abundance of coal and natural gas for fuel, combined with the plentiful supply of the pure quartz sand, the state has developed the greatest glass-making industry in the country, with nearly two-fifths the total annual output. The glass-making is carried on mainly in the western part of the state in Allegheny, Westmoreland, Washington and Armstrong counties, where the supply of gas, sand and clay for furnace use are all convenient.

Glass sand is to be found in varying quanities in nearly all the central, and in much of the western part of the state. The greater amount of this sand mined in the state comes from the region of McVeytown, Gainville and Vineyard, in Mifflin County, There, an extensive outcrop of nearly white quartz sandstone affords not only valuable deposits of the disintegrated rock, but also large exposures of the rock, which can be crushed readily or will disintegrate quickly when quarried and left exposed to the air and moisture. Other sand producing localities are located along the Monongahela and Youghiogheny, at Derry in Westmoreland County; near Durbar and Connellsville, in Fayette County; at Falls Creeks, in Jefferson County; in the vicinity of Pittsburgh; and at Columbia, on the Susquehanna River.

At the beginning of the last century, glass-making was carried on mainly along the Atlantic coast in Massachusetts, New York, eastern Pennsylvania, New Jersey and Maryland. Then wood was used for fuel and could be secured in abundance from nearby localities. Coal was first used as fuel in a glass factory at Pittsburg, about the year 1797, but its use did not become general until many years later. With the general adoption of coal as fuel, followed by the introduction of natural gas, the industry was transferred to the western part of Pennsylvania, which quickly became the center of glass production in the United States.

Mineral Paints.

Mineral and metallic paints, made from various ores are manufactured in Pennsylvania in Lehigh and Carbon counties in the east and in Mercer County in the west. The ores used are mainly those of iron, hematite and limonite, the red and brown ores of iron which are often found in the clay deposits of the limestone districts. From the so-called "pot deposits" yellow ochers are mined at several places in the great valley. In the production of metallic paints and of ocher the state ranks first. Although the ores from which these metallic paints are made, are widely distributed over the country, the deposits which are suitable for making good paints are limited to a few localities. In 1905 the state produced a little over two-fifths the total value of metallic paints and over one-half the total value of ocher.

Stone Quarrying.

To anyone at all familiar with the surface of Pennsylvania, it is not surprising to learn that it is the greatest stone quarrying state in the country. The value of the product represents about one-sixth the total value of stone quarried in the United States. Limestone, slate and sandstone are the varieties in which Pennsylvania leads; in quarrying of granite and marble, other states rank far ahead.

The most important rock quarried, according to the value of the product, is limestone. Almost everywhere that it occurs throughout the state it has been quarried for one purpose or another. The main uses at the present time are for flux in the iron furnaces, for burning in the manufacture of lime, for road metal, railroad ballast and for concrete. The whole eastern and central part of the state, wherever limestone occurred, was formerly dotted with kilns burning lime for commercial and agricultural purposes. In these early kilns, wood was used for fuel and was easily obtained from the local supply. But the change to coal as fuel gave an advantage to the districts most conveniently located to receive coal from the railroads, and most of the small kilns have fallen into disuse. The principal burning of limestone in the manufacture of lime is now carried on in the great valley region, and in the limestone districts of Huntingdon and Blair counties.

A large part of the limestone quarried for flux, comes from Blair County in the center of the state and Lawrence County in the west. Much of the limestone of the central region, especially in Huntingdon County, breaks into angular blocks which are very durable and admirably adapted for railroad ballast. For this purpose large amounts are quarried annually. This same rock is used in many places for crushed stone in road building, standing next to trap in the quality of road produced.

Next to the limestone quarries, the products of the slate belts are the most important. This state produces more than half the slate for the country. In general the slates are limited to the southeastern counties, occurring in several bands in the older rocks of that region. Perhaps the most famous of the slate areas is the one at the eastern end of the Great Valley, from the Delaware Water Gap westward to the Lehigh. Along this line large settlements of slate workers have opened quarries, and built important towns and villages as Slatington and Bangor. At the latter place is located the biggest slate quarry in the world, with a depth of over 300 feet. Similar industries are located along the same belt in New Jersey and in New York. The slate formation also extends southwestwardly all the way to the Maryland line, but no important quarries have been opened west of the Schuylkill. The value of the slate depends on the texture, and on the property of cleavage, or the tendency to split into slabs. The slates are used principally for roofing purposes, though much of the better qualities, finer grain and more even texture, are still used in school slates, in sawed or planed goods, as paving or tiles, and for tanks, mantels, billiard tables, etc. To the traveller it is a decidedly novel sight in the slate country to see small cottages, barns, sheds, even the smallest buildings roofed with slate instead of with the conventional wooden shingle.

Other important localities where slate occurs, are in the South Mountains, much of it being of inferior quality, and at the historic Peach Bottom quarries near the Susquehanna River in southern Lancaster County.

The supply of building stone in Pennsylvania is too plentiful. Almost everywhere in the state the owner of a small plot of land can, by digging a hole, quarry enough good, easily worked stone, for his own use. Sandstone for building material, has been quarried in the belt extending from Bucks county to the Maryland line. From this area has come much of the so-called brownstone, used in the houses of Philadelphia. In the central ridges of the state, there are unlimited amounts of building stone of the finest quality, but it is a drug in the market. Some of the sandstones, of finer grain, are also suitable for use as flags in paving. This variety is found in some parts of the Pocono regions, where large quarries have been opened in flags from two to five inches thick, and almost any size desired. At Millville, Palmyra, Wilsonville, Shohola and Barryville, this phase of quarrying has been developed. It was just across the river in New York state that the monster flag twenty-five feet by fifteen feet by eight inches was quarried for the pavement in front of one of the Fifth Avenue mansions in New York City.

Marble has been quarried in large amounts in the Chester Valley, and at Conshohocken and Marble Hall, in Montgomery County. From this latter locality, marble was sent to the Washington monument, and for the buildings of Girard College. Its proximity to Philadelphia explains its former general uses in the ornamental work, for street steps and for windowsills and caps in the brick dwellings. The white and clouded marble are still quarried on a small scale at Avondale and in the Chester Valley.

The serpentine of Chester County was also formerly quarried extensively at a number of places near Avondale and vicinity. These quarries furnished the familiar green stone for a number of buildings of the University of Pennsylvania, for the Academy of Natural Sciences, for many private houses in Philadelphia, and for the court house in Wilmington. The serpentine was very popular some years ago, because of the soft green color, its supposed durability, and also because of the ease with which it could be sawed or chiseled into blocks, and other desired forms. It is not especially durable, however, and few of the quarries are now operated for building stone.

Summary.

Pennsylvania is by far the greatest state in the country in point of mineral wealth. In 1905 the total value of mineral products for the whole country was approximately, $1,625,000,000. Of this value, $570,000,000 was the share of Pennsylvania alone—more than three time the value of the Ohio product, that state ranking second, and greater than the combined output of any five other states. Practically all of the resources upon which this preeminence depends are resources which are capable of even greater development than at the present time. New York state now ranks ahead of Pennsylvania in size of population and money wealth per individual. But the resources of New York are far inferior to those of Pennsylvania, except for the development of commerce.

The manufacturing industries of New York State depend upon the supply of fuel from Pennsylvania mines. And much of the bulk of New York foreign shipments consists of goods made in Pennsylvania factories and diverted from their proper Pennsylvania ports because of railroad interests. It is not too much to say that in regard to natural resources Pennsylvania is now the greatest state in the Union and destined to still more important rank in the future.

THE DISTRIBUTION OF PEOPLE IN SOUTH AMERICA

BY PROFESSOR MARK JEFFERSON
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The distribution of people in South America is somewhat peculiar. The densest population on the adjoining map is over twenty-six to a square mile, that is, a little more than the average density of the United States. The patches of dense population are seen at once to lie always within 400 miles of the sea. A northeast southwest line through the center of the continent would have a region to the southeast with almost all its dense patches on the coast; another to the northwest with none at the coast, but all near it. What determines this arrangement? The mountains of the continent: for South America, though endowed with two of the greatest river systems of the world, leaves the greatest of these solitary and deserted and finds its mountains all-determining for the homes of its nations. A glance at any map showing relief reveals the fact that the dense populations of the northwest lie along the high valleys of the Andes, and that the "moderate" peopling, indicated by ruled lines, observes a similar behavior down to the tropic of Capricorn. The descent from the Bolivian highland east and west alike brings us down to a "thin" population on the west and to a lonesome land on the east. In Peru and Ecuador the moderate population reaches the coast, while in Colombia and Venezuela the transition is from dense along the central Andean chains to thin at the coast and on the plains of the Amazon.

The vast basin of the Amazon is seen to be all but deserted. Brazil has its people gathered along its eastern border, where it, too, is high, but the people have not drawn away from the coast as on the Pacific. Of Brazilian large towns only Sao Paulo lies inland; in the northwest, a glance of Fig. 2 shows us twenty-four cities of more than 5,000 people each from five to thirteen thousand feet above the sea and averaging over a hundred miles inland.

Only La Guayra, Guayaquil, Callao and Lima are on the low coast lands, while most of the famous cities, Caracas, Bogota, Quito,

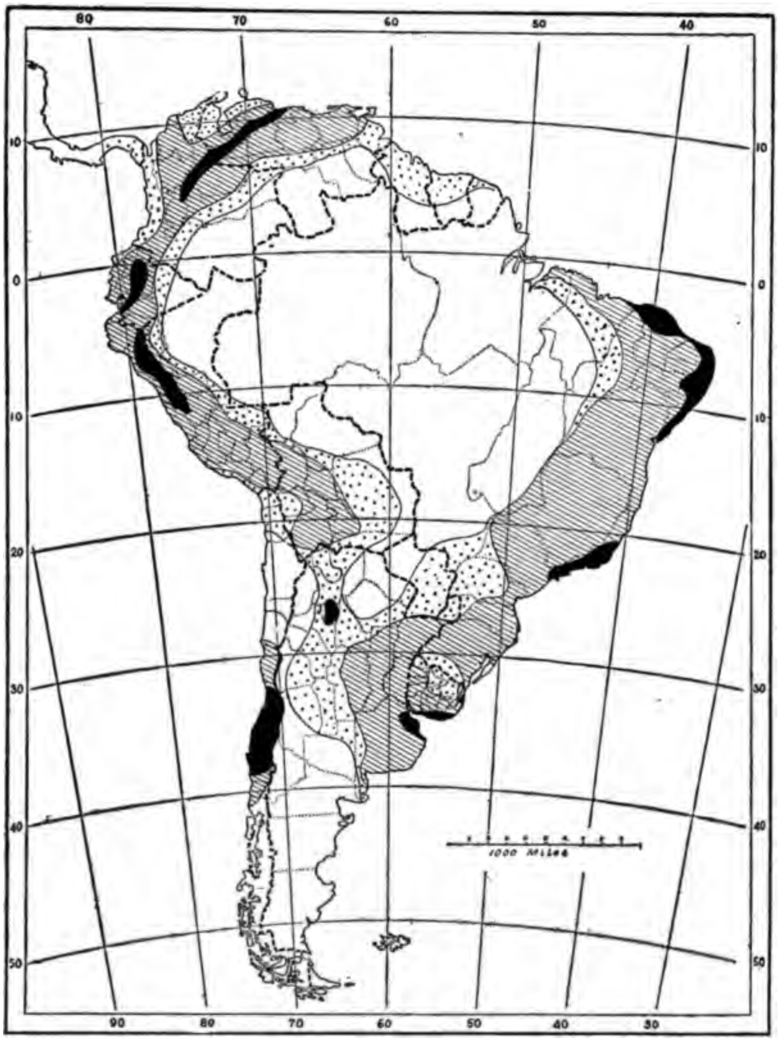

FIG. 1.—Distribution of Population in South America. Data chiefly from Statesman's Year Book, 1906. Darkest shade more than 26 to 1 square mile; ruled, from 8 to 26; dotted, 2.6 to 8, and blank, less than 2.6 persons per square mile.

Riobamba, Cuzco, Arequipa, Puno, La Paz and Sucre are one or two miles above the sea, elevations unparalleled elsewhere in the world. Tropical South America has its people in the five mountain republics of the northwest—Venezuela, Colombia, Ecuador, Peru and Bolivia, and on the elevated eastern sea border in Brazil. The Amazon basin is a great hinterland on which all have claims, for the most part ill-defined or in dispute, but in which none have any significant number of citizens. The Guianas should be regarded merely as settlements to facilitate the commerce of three European states. The Amazonian hinterland is in complete possession of aboriginal savages apart from the isolated trading points along the

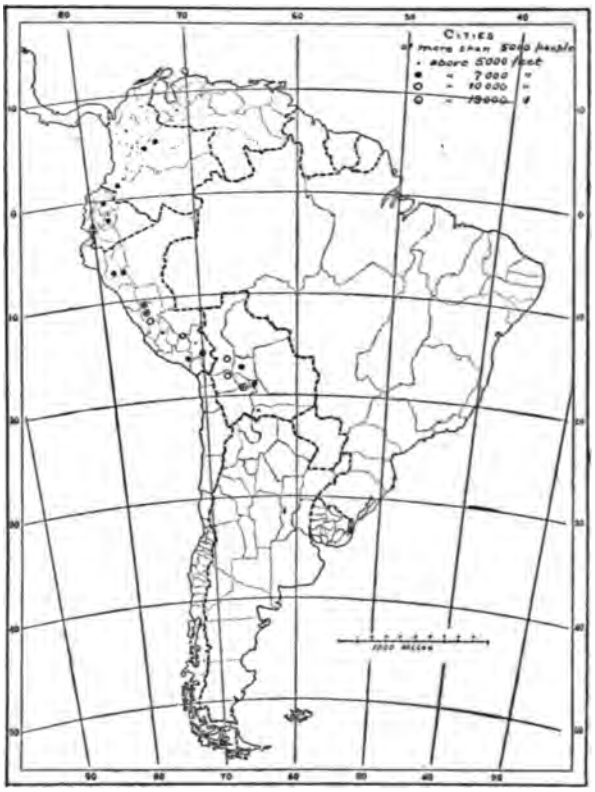

Fig. 2.—The high cities of South America. All have more than 5,000 people, and are from 5,000 to 13,000 feet above sea level, as shown by the legend.

waters. The equatorial position, of course, is the cause. The dominant races seek the mountains to escape from the heat and moisture of the lowlands. The tropical Andes are the great rain producers of their continent in the cooling lift they give to the trade winds that blow from the Atlantic against their eastern slope, but their upper valleys are drier and are the truly temperate regions of the world. North of the twentieth parallel South America hardly knows greater differences between summer and winter temperatures than five or ten degrees. A lowland range of 75 to 85 degrees proves very favorable to rubber, sugar cane, coffee and cacao, but man ever since Inca days has preferred the drier, cooler mountains, always with the same narrow range. In the Andean republics the denser populations live where the thermometer ranges mostly between 50 and 60 degrees or 55 and 65 degrees. It is curious that the region where the aborigines had risen into beginnings of civilization on the advent of the Europeans, the regions which witnessed such splendid beginnings of Spain's dominion in the west, should to-day linger so far behind the whole extra-tropical region.

South of the tropic the Andes serve to part men as well as waters. The high valleys there are too bleak for permanent homes. There the Andes are a wall, a boundary. They are not essentially in Chile and the Argentine, but east of Chile and west of the Argentine Republic, a relation entirely different from that which prevails further north. The lowlands there has distinct summers and winters, hot and cool respectively. They are somewhat short of moisture, notably in the western Argentine plains, under the wind shadow of the Andes, for in this region of westerly winds the rains come from the Pacific or from disturbances that sweep eastward across the continent. The plains here, narrow in Chile, broad in the Argentine, are the home of prospering, thriving men, of communities that are taking part in modern life, with schools, railroads and active commerce, that puts them in contact with the other active peoples of the earth.

It is singular to see the abrupt falling off in population toward the fortieth parallel. All the great nations of Europe lie nearer to the pole, some of them finding no difficulty in approaching the sixtieth parallel. In North America certainly not the least vigorous and progressive part of the people live beyond 40 degrees north latitude. That perhaps is not an easy expansion for a Latin race to make. The cities of Fig. 3 show the same features, though Punta Arenas (Sandy Point) lies hidden in the maze of channels in the straits of Magellan.

The clustering towns of central Chile between the desert on the north and the wet fiord country on the south, attest the correctness of the distribution shown on the larger map. The towns and population-shading of Uruguay remind one of its native name, the "Eastern Shore" (Republica de la *Banda Oriental* del Uruguay). In the Argentine an Uruguayan is an "Easterner" (Oriental). It is economically one with the Argentine Republic, the eastern border of the great arm of yellow water that serves as entrance to the Pampa country.

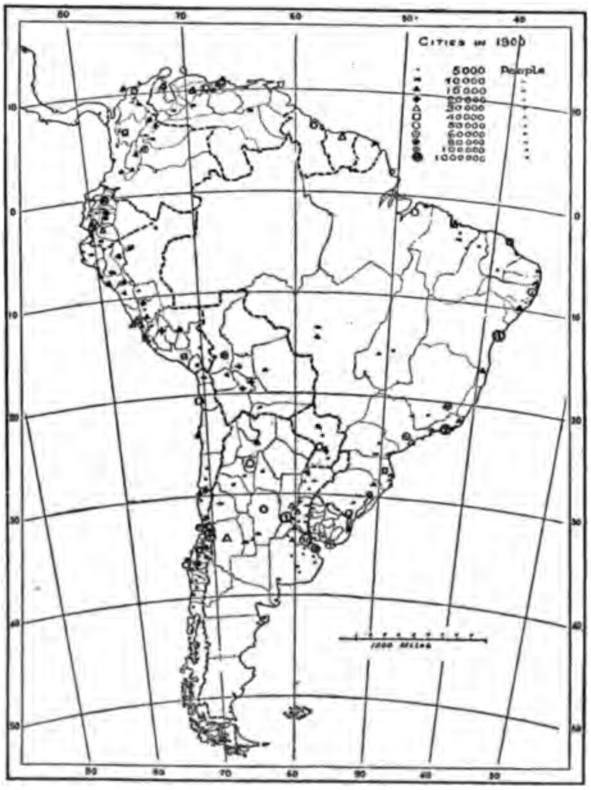

Fig. 3.—Size of all Cities with over 5,000 People.

We see here better than on the population-shading the vigorous town of southern Brazil, notably of Sao Paulo and Rio Grande do Sul, beyond the tropic.

The dense population in the northern Argentine on Fig. 1 is now seen to center on Tucuman city, with its 55,000 inhabitants and the great sugar estates. This region, like Chile, was settled by the Spaniards from the plateaus of Bolivia, an eastward colonizing movement that even reached Córdoba, 300 miles farther southeast, its full name record—this history, Córdoba del Tucuman. The gap between Buenos Aires and Córdoba was long maintained by raids of hostile Indians from the southern pampas, finally stopped by General Roca about 1870. Not without reason do Santiago de

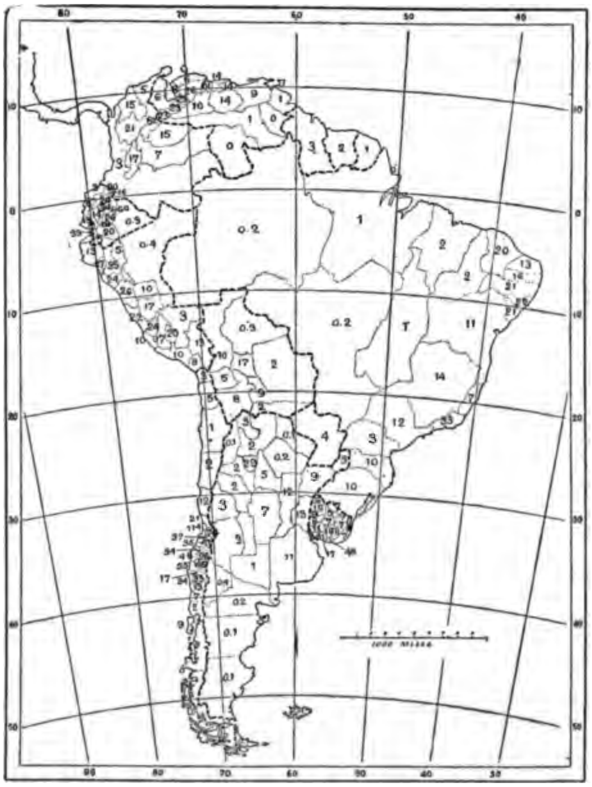

FIG. 4.—People per sq. mile in each Province. Statesman's Year Book, 1906.

Chile (300,000) and Mendoza (30,000) look at each other across the Uspallata pass, the 12,000 foot sag in the Andean walls, for here, too, settlement came from the west, and the Argentine city and province of vineyards preserve in their name the memory of the Chilean governor, Diego de Mendoza.

It appears from Fig. 3 that the Andean republics have no large cities, Bogotá being the only one to reach 100,000 inhabitants, Caracas has but 70,000, Quito 80,000, Cuzco 15,000, Arequipa 40,000, La Paz 60,000 and Potosi 20,000. These are the great cities of the Spanish conquest. Buenos Aires with a million, and Rio Janeiro with 700,000 (1905) are the only large cities of the continent, both on the coast toward Europe.

The data for Fig. 1 have been taken from the Statesman's Yearbook for 1906. Fig. 4 shows the number of inhabitants per square mile, taken from that publication province by province. Of course in many cases, notably in Venezuela, Colombia, Ecuador and Peru we have only estimates, for all kinds of statistics are much neglected in those isolated regions. For Ecuador even the areas of the provinces are quite unknown. In this state, therefore, I have measured the provinces from the map in the Atlas de Geografia de Ch. Bouret, Paris, 1884, obtaining the following areas, beside which I have noted the populations from the Statesman's Yearbook and the population per mile that results:

	Area in sq. miles.	Population.	Inhabitants per sq. mile.
Carchi	1,790	36,000	20
Los Rios	2,340	32,800	14
Guayas	6,640	98,100	15
Esmeraldas	5,550	14,600	3
Imbabura	4,150	68,000	16
Pichincha	8,590	205,000	24
Manabi	8,200	64,100	8
Leon	3,260	109,600	34
Tungurahua	1,730	103,100	60
Chimborazo	4,810	122,300	26
Azogues (Bolivar)	2,320	43,000	19
Del Oro	830	32,600	39
Azuay	6,700	132,400	20
Loja	13,170	67,000	5
Oriente	45,900	12,600	0.3

Comparison of Fig. 4 with the population map will show that lines have not been drawn sharply on province boundaries. Attention may be called for a moment to the province boundaries of the base map, best seen in Fig. 2. It was found necessary to prepare this map at the beginning of the study of distribution. A glance at it shows that it contains in itself some prophecy of what that distribution is, for if we make exception of Uruguay, small provinces are found to mean populous provinces. The dark shade in the Andean republics on Fig. 1 traces the line of the smallest subdivisions, so also in the case of the southern "dense" areas, while the Amazon basin has provinces like European kingdoms. Empty Patagonia is only second in this respect. The principle is of course world wide in its application, as in the size of the individual states of the United States or in the provinces of Russia.. The population of Chile is amazingly well foretold by this feature of size of departments. In a continent where information is so difficult to get the confirmation thus obtained for our figures is welcome. Fig. 4 does not appear at first to justify with its figures the drawing of outlines for the dark shade in Peru. But we learn from Supan's work on the Population of the Earth in 1900[1] that the shore portion of several Peruvian departments is much more thinly settled than the mountains. He gives numbers per square kilometer that I turn into square miles by multiplying by 2.59. Piura, recognizable on Fig. 4 by the population number 13, has 15 to the square mile in the mountains east of the eightieth meridian; Libertad, whole province, 24 to a square mile, has 18 on the coast lowland, 28 in the mountains; Ancachs, as a whole 26, has 8 on the coast and 31 in the mountains; Arequipa, as a whole 10, has 3 on the coast and 18 in the heights. By these facts the figures of Fig. 4 have been modified and in general smooth even lines have been drawn. Occasionally the position of towns has seemed a reason for such modification of the province units. This may justify the drawing of the denser shade near Cape San Roque. If we had full detailed knowledge it is certain that the boundary line would be more irregular. Experience with similar work in Europe and the United States assures us of this. Some at least of the simplicity of the outlines shown here is the simplicity of ignorance, a feature likely to characterize all distribution diagrams of South America and Africa for some time yet. But enough relation has been shown between the various classes of facts cited to inspire faith in our general facts.

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[1] **Petermann's Mitteilungen Ergänzungsheft nr. 146, *Amerika*, p. 59.**

The populations of cities of Fig. 4 is obtained from Supan's work, from the publications of the Bureau of American Republics and from the Statesman's Yearbook. The populations given are for years all the way from 1890 to 1905. The larger and more important towns are for recent years as given in the last-mentioned authority. Much trouble has been taken in the effort to include all the towns of 5,000 and upward and to allow none of smaller size to slip in. In this I know I have not succeeded, but it is believed to be an advance on other maps in this regard. Not a few

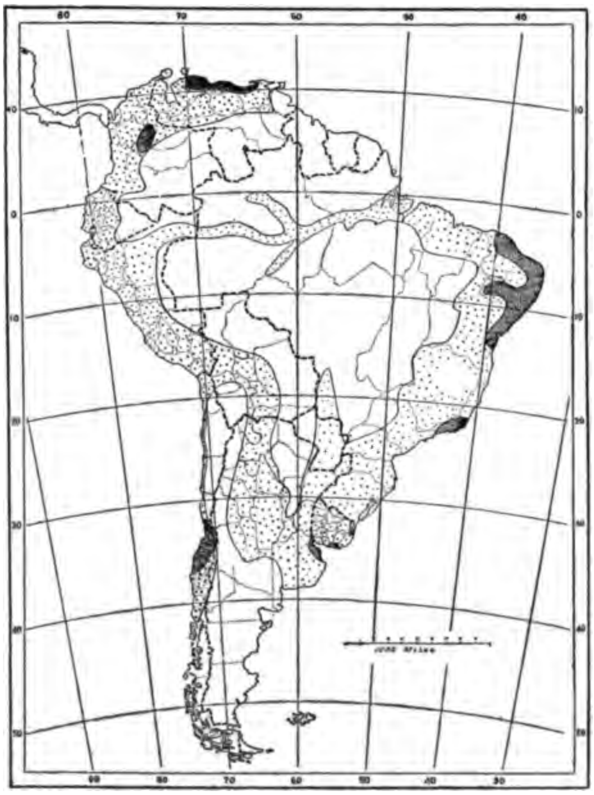

FIG. 5.—Distribution of Population according to Berghaus' Physical Atlas, 1884. Over 26 to a square mile, darkest; 2.6 to 26, dots.

towns of 5,000 to 10,000 people appear here that are lacking in works so pretentious as Stielers Handatlas, ninth edition, where towns much smaller are given. This is the case in the Argentine province of Buenos Aires, for example, where it is possible to ascertain the facts. In Colombia and Venezuela it is difficult to be sure of anything.

A population map has also been made from Supan's data, agreeing well with Fig. 1, though Supan's data are somewhat less complete. In Petermann's Mitteilungen for November 24, 1906, appeared a world population map by Woeikow with general similarity to our result, but very carelessly drawn; thus Woeikow shows the dense Chilean population extending as far east of the eightieth meridian as the coast is west, making it include a part of the Argentine; draws the dense population at the mouth of the La Plata quite wrongly, as also the province of Tucuman, the coast of Ecuador and parts of Peru. Fewer grades of population are used than are desirable for good results in South America. I have found interest in the omission by Woeikow of the strip of thin population along the Amazon, often copied from the Berghaus map of 1888.

This map,[2] which I reproduce in Fig. 5, has long been our source of information for the facts. The main facts of population have not perhaps altered much in the time since this map was made. It is a world map like Woeikow's and therefore lacks the 8 to 26 shade of density, but it represents the facts for its legend very closely. The strip of population along the Amazon and the tributary Rio Negro and Madera, as well as the projection from the La Plata country into southern Brazil precisely in the region of the Xarayes swamp, seems to be based on a belief that so many of the savages dwell on the banks of the rivers that the shade is justified. None of the figures that I have come across are for anything less than the whole province, however, and too little is known of the interior back from the streams to justify the assumption.

The result of such studies, a fairly correct view of the distribution of people in a continent, is entitled to prominence in teaching geography. Formerly such maps were not possible. A statement in words of the facts of such a map leads to many questions of cause that introduce relief, temperature, rainfall and commerce in

[2] Nr. 62 in Völkerkunde, Berghaus Physikalisher Atlas, 1888, Gotha, Justus Perthes.

a very natural way. For class work the maps must be large. Small diagrams are cheaper to make, but young pupils wants them big. They rebel at many maps now offered them on this ground. State boundaries, parallels and meridians should be on all, but they should not be crowded with other information. The open spaces on a map make possible the reading of what other data are displayed there and are not wasted. To-day they should prove an admirable aid in the geography of the world as taught in lower schools.

ACTIVITIES OF THE SOCIETY

THE SAN FRANCISCO EARTHQUAKE

ADDRESS BY

PROFESSOR ANDREW C. LAWSON

At the Stated Meeting, April 3, 1907.

At the regular April meeting of the society Professor Lawson, Chairman of the California Earthquake Investigation Committee, gave an intensely interesting and instructive account of the San Francisco disaster of 1906. At the same time he told much about the nature and behavior of earthquakes in general, all of which was admirably supplemented by a large number of excellent ilustrations. He said in part:

"Earthquakes are among the most common events in nature, and they are of such frequency that probably, taking the earth as a whole, there is no time at which these disturbances are not going on at one place or another, although the intensity of the disturbances may be feeble.

"As to the cause of these disturbances, scientific opinion is not quite settled and it is referred to certain slips or fractures in the earth's crust. When such fractures are of large extent and depth, we have violent and destructive earthquakes. But while earthquakes may occur and do occur in all parts of the earth's crust, there are two zones of exceptional seismic activity. These are the rim of the Pacific Ocean and the Mediterranean-Himalayan zone. On the American side of the Pacific there has been extraordinary activity in recent years. In the last seven or eight years there have been nine earthquakes of the first order. Three of these occurred in Alaska; three in the Central American and Southern Mexico region, one in Ecuador and Colombia; one in California, one in Chile. In the Mediterranean-Himalayan zone there have been twelve notable and destructive earthquakes in the last ten years, distributed as follows: Assam and the Punjab in India, Smyrna, Caucasus, Turkestan, Macedonia, Formosa (4), Calabria and Jamaica.

"The concurrent activity in these two great seismic zones in the same period of time indicates a general tendency in the earth's crust to relieve the stresses which have been accumulating within it. In those regions, where the destructive earthquakes have recently occurred, it becomes a matter of interest to note what the probability of their recurrence may be. In this regard all that can be said is that in the region where the stresses in the earth's crust have been relieved by rupture and by consequent shock, it is probable that it will require many years for the accumulation of the stresses necessary to bring about another movement on the same rupture plane. In California, earthquakes are perhaps more common than in any other part of the United States. Previous earthquakes of destructive effect have occurred in 1857, 1865, 1868, 1872, 1892 and 1898, but only one of these, namely, that of 1857, occurred on the same line of movement as that of the earthquake of April 18, 1906, and that was on another part of the line of rupture further south. Extending through California from the vicinity of Cape Mendicino obliquely across the Coast Range to the Colorado Desert is a line of peculiar topography which has been recognized as an earthquake crack among the people of the country. This line is marked by a series of features which are referable only to earth movements for their origin, and are in sharp contrast to other topographical features in the region which are chiefly due to erosion. This line, known as the rift line, is the resultant of many movements, each of which in past time has given rise to an earthquake of greater or less violence. The earthquake of the 18th of April, 1906, was the result of a recurrence of the movement of this rift. The movement at the time of the earthquake was of the nature of a horizontal displacement on a vertical rupture plane, resulting in what is known in geology as a fault; the outcrop of this fault lies wholly within the zone of the rift and has an extent of about 270 miles. It is usually marked by a furrow in the ground or a series of cracks and sometimes by low scraps indicative of an uplift on the west side of the fault. The vertical displacement probably nowhere exceeded three feet and was chiefly confined to the northern portion. The horizontal movement of the fault was indicated by the displacement of all fences, roads, railways, bridges, tunnels, dams, pipes and property lines which happened to cross its path. The amount of the horizontal displacement varied from a few feet up to as much as twenty feet, and many cases were observed of a displacement of from ten to fifteen feet. Not only were all such lines dislocated, but the latitudes and longitudes of a considerable portion of the Coast Ranges were changed. The effect of the fault was to set up a series of vibrations in the earth's crust which shook all structures and objects on the earth's surface for a considerable extent on both sides of the fault line. For several miles away from this fault, this agitation of the ground resulted in notable destructive effects; in general, the intensity of the shock diminished in proportion to the distance from the fault line, but if we take the throw of ordinary brick chimneys as indicating the limit of destruction, that zone may be placed at seventy miles in width, or at thirty-five miles on each side of the fault. The distribution of the intensity was not, however, wholly determined by the distance from the fault line. The character of the underlying geological formations was a large factor in determining the degree of destruction which the shock produced. Buildings situated on the soft incoherent ground in the bottom of valleys and on the margins of water, suffered very much more severely than did quite similar structures built upon the solid rock, even although the latter may have been much closer to the seat of disturbance. This was particularly true of the low ground on the water-front of San Francisco where a great deal of the area of the city was "made land" which had been recovered from the waters of the bay by filling-in with loose material. This influence of the character of the underlying formation upon the degree of destruction is one of the most important lessons gleaned from the study of the California earthquake.

THE ERUPTIONS OF VESUVIUS.

ADDRESS BY

DR. TEMPEST ANDERSON

At a meeting of the Society, April 27, 1907.

The society was especially fortunate in having Dr. Anderson as the speaker at the special April meeting. Dr. Anderson is an earnest student of volcanoes and volcanic action, having made himself familiar with some of the most important volcanic regions of the earth. He came to this country fresh from the scene of the recent activities in the West Indies, before which time he had been studying the phenomena associated with the eruptions of Vesuvius.

Dr. Anderson's theme was primarily that of Vesuvius and its eruptions, but at the same time he very skillfully and entertainingly wove into his discourse a great deal of specific information about vulcanism in general. Nowhere can a better or more complete idea of the history of Vesuvius be found than in the history as portrayed by this eminent English scientist. A complete series of illustrations, showing Vesuvius at different times in its life history, materially aided in emphasizing the number of changes through which this most interesting of all volcanoes has passed.

IMPRESSIONS OF THE CANADIAN ROCKIES

ADDRESSES BY

MISS LAURA BELL

and

MRS. CHARLES SCHÄFFER.

At the Stated Meeting, May 1, 1907.

One of the most entertaining and most successful meetings of the year was devoted to Miss Bell's "Impressions of the Canadian Rockies," followed by Mrs. Charles Schäffer's account of "Exploring Among the Tributaries of Saskatchewan River." The BULLETIN has already been fortunate in securing an interesting account—printed in the April issue—of Mrs. Schäffer's experiences. Her address before the society was even more interesting through the addition of personal touches and because supplemented by a large number of unusually beautiful views.

Miss Bell is always gladly welcomed by the members of the society. An ardent traveller, a careful observer, and a skillful, sympathetic interpreter of what is to be seen, Miss Bell always returns with a wealth of delightful impressions in which the society is eager to share. The "Impressions of the Canadian Rockies," ably supported by picturesque illustrations, were well calculated to add a still larger number of the members to the already long list of enthusiastic explorers of that wonderful region.

AWARD OF THE ELISHA KENT KANE MEDAL

TO

CAPTAIN ROALD AMUNDSEN.

At the Stated Meeting, May 1, 1907.

In the by-laws of the society is the following provision: "A medal, to be known as the Elisha Kent Kane Medal of the Geographical Society of Philadelphia, may be awarded annually by the society, on the recommendation of the Board of Directors, to such person as may be designated by a three-fourths vote of the entire Board of Directors, and approved by the majority of members present at the meeting, and only for important geographical exploration or research made during the twenty-four months preceding the award. The award shall be made at the May meeting of the society."

The Board of Directors, in accordance with this provision, unanimously voted to confer the medal for 1907 upon Captain Roald Amundsen, in recognition of his valuable work in accomplishing the "northwest passage" and in the discovery of the north magnetic pole, one of, if not perhaps the greatest of scientific contributions to come from Arctic exploration.

In presenting the medal President Emory R. Johnson said in part: "The Gjoa, a little sailing vessel of forty-six tons, with a petroleum motor of thirteen horse-power, sailed from Christiana, June 16, 1903. It reached Nome, Alaska, September 3, 1906, after having spent nearly two years on the south-eastern coast of King William's Land. A large area was charted for the first time, substantially adding to our fund of accurate information regarding the Arctic regions. Magnetic observations extending over the period were taken at this point—about ninety miles from the north magnetic pole—observations which are of great value to the scientific world."

"Because of his contributions to knowledge, both in geography and in geophysics, and quite as much because of his heroic qualities, the Board of Directors has conferred its highest honor,—the Elisha Kent Kane Medal—on Captain Roald Amundsen."

Captain Amundsen, being in Norway, was unable to accept the medal in person, as had been hoped earlier in the year. His excellency, the Hon. Chr. Hauge, Minister from Norway, consented to accept the medal for Captain Amundsen.

GEOGRAPHICAL EXCURSION TO PRINCETON.

May 25, 1907.

The Excursion Committee is to be congratulated on the arrangement for, and conduction of, a delightful excursion to Princeton on May 25, which was enjoyed by about a hundred members of the society. Professor Scott, of Princeton University, was the leader of the day. The forenoon was spent in a tour of the university grounds and buildings. After a pleasant lunch at the Historic Inn, a trip was made to the battlefield. Returning from there the company went to Professor Scott's home where tea was served, and an inspection of his valuable library and collections completed one of the most attractive excursions of the year.

The number present on the excursion was all too small. The work of the Excursion Committee is a phase of society activity which is worthy of much more general appreciation. The members of the committee devote much time and careful planning to make the excursions attractive and successful. The choice of places visited is always the result of earnest forethought and consideration for the greatest possible enjoyment and profit. Out of door geography should become one of the most popular, as it is one of the most enjoyable, activities of the society. The members of the Excursion Committee deserve a greater appreciation of their unselfish efforts to furnish pleasant expeditions into the field. In the autumn there will be other excursions. Every member who has been before is sure to go again if possible. To those who have never taken part in this study of real live geography, The BULLETIN extends a hearty recommendation of the little journeys planned by their fellow members.

REPORT OF THE LIBRARY COMMITTEE.

The BULLETIN is very glad to print the following report from the Library Committee, in order that the members of the society may know of the exceptional and valuable library facilities which are always at their disposal. The number of members taking books from the library is entirely too small—less than seven per cent of the total membership of the society. It is also worth while to call attention to the large number of magazines which are available at all times in the library room. These magazines include not only scientific periodicals, domestic and foreign, but also a number of the leading general magazines.

It is gratifying to note the growth of the library during the past year—over one-sixth the total number of volumes having been added in that time. It should also be a source of satisfaction to the society to note the list of exchanges, the other societies the world over to which our publications are sent, and from which their publications are received. In all this growth of the society, in library and scientific activities, as well as in membership, the BULLETIN is a distinct material help. Through the BULLETIN the exchange list has been enlarged—136 exchanges added in one year—and through the book review department of the BULLETIN, the society is enabled to secure from the publishers or the authors many valuable books on geography and travel.

The attention of the members is earnestly directed to the following report, with the hope that through their more hearty co-operation in the activities of the society the growth in 1907-1908 shall again exceed that of all previous years.

PHILADELPHIA, May 10, 1907.

The Library Committee respectfully submits the following report for the year 1906-07:

Total number of volumes in library 2408

Books	1262
Bulletins and monographs	1146

Total number of books added during 1906-07	402
Total number of bulletins and monographs, 1906-07	227

Books classified by source:

Number of books purchased	82
Number of books donated by members	78
Number of books received from authors	21
Number of books received from publishers	60
Number of books received from U. S. Government	22
Number of books received from State governments	3
Number of books received from Foreign Governments	72
Number of books received from Scientific Societies	64

Books classified by continents, etc.:

North America	70
Central America	13
South America	55
Africa	27
Asia	94
Europe	48
Oceanic and Polar Regions	28
General Travels	6
Geography	48
Statistics	88
Meteorology	1
Science	54

The amount spent during the year for the purchase of books......$42.28

Number of members taking books out....60

Exchanges—total number		217
Geographic—Foreign	93	
Geographic—Domestic	12	
Scientific—Foreign	44	
Scientific—Domestic	68	

Exchanges added during the year 1906-07	136
Pediodicals added during the year 1906-07	10

Scribner's Magazine
McClure's Magazine
Harper's Monthly
The Century Magazine
The Outing Magazine
The World's Work
L'Illustration
Pacific Monthly
Sunset
Modern Mexico

It is the hope of the Committee that during the coming year they will be able to subscribe to some of the European magazines, notably German and French, which can be secured in no other way.

Theodore Le Boutillier,
Angelo Heilprin,
Mary S. Holmes.

NEW OFFICERS FOR 1907-08

The following officers and committees have been chosen for the year 1907-1908:

President
Mr. Alba B. Johnson

Vice-Presidents
S. Hudson Chapman
Howard W. DuBois

Recording Secretary
Dr. Theodore LeBoutillier

Corresponding Secretary
Dr. Paul J. Sartain

Treasurer
J. Bell Austin

Executive Committee
Amos Bonsall, *Chairman*
Miss Mary A. Campbell
Miss Laura Craven
William J. Serrill

Finance Committee
Edward I. H. Howell, *Chairman*
Clarkson Clothier
Benjamin R. Hoffman

Entertainment Committee
Miss Laura Bell, *Chairman*
Miss Mary S. Holmes
Miss E. E. Massey
Mrs. Alden H. Weed

Publication Committee
Walter S. Tower, *Chairman*
Miss Laura Bell
Henry G. Bryant
Thomas R. Hill
Dr. Henry Skinner

Library Committee
Dr. Theodore LeBoutillier, *Chairman*
Prof. Angelo Heilprin
W. A. Shryock

Reception Committee
Miss Mary Blakiston
Mrs. Theodore LeBoutillier
Mrs. William S. Hallowell
Mrs. William Lybrand

BOOK DEPARTMENT

Book Notes and Reviews.

Arthur, Richard. *Ten Thousand Miles in a Yacht.* Round the West Indies and up the Amazon. Pp. 253. New York: E. P. Dutton & Company.

In a charming journalistic style, without pretense at exhaustive treatment, Mr. Arthur relates the events of a three months' cruise of ten thousand miles, made by the yacht "Virginia" in 1905.

On January 30th, ten men and a boy, guests of commodore E. C. Benedict, set sail for the Amazon, visiting on the way the Bermuda Islands, Dominica, Martinique, Santa Lucia and Barbadoes. Much of interest is related by Mr. Arthur of the flora and fauna as well as the characteristics of the natives of these islands.

Very interesting to the ethnologist are the Brazilians of to-day; a people practically indigenous,—Indian, with an admixture of Negro or Portugese blood, or both.

In strong contrast with the rural districts is the distinctively modern civilization of the two great Amazonian cities, Para and Manars, between which and Paris the author observes resemblances in plan and architecture. Mr. W. M. Ivins, a student of this people, in the introduction, emphasizes the fact that a new racial type has been developed in the Brazilian, and that this new type is expressing itself in a new and promising literature.

Three maps and one hundred and thirty-nine excellent photographic illustrations add to the understanding and interest of the volume.

Rachael P. Barker.

Baedeker, Karl. *The Rhine.* Pp. 461. Karl Baedeker, Leipzig, 1906.

The latest edition of Baedeker's guidebook for the much traveled Rhine district contains the usual valuable fund of information so indispensable to prospective European travellers. The volume maintains the highly reliable character for which "Baedeker" has long been noted.

Baedeker, Karl. *Canada.* Pp. 331. Karl Baedeker, Leipzig, 1907.

This third edition of the guidebook for Canada, revised and enlarged, will be welcomed by the many who find the Canadian districts so attractive for the annual summer sojourn. The vast area of Canada, with the fact that so much of it is still but little known, necessitates the more or less unsavory mention of many places. The usual good maps and plans, along with the feature of including Newfoundland and a trip to Alaska, make an unusually convenient volume for the prospective traveller into the "northland."

Barnard, J. Lynn. *Factory Legislation in Pennsylvania:* Its History and Administration. Pp. xi, 178. Publications of the University of Pennsylvania. J. C. Winston & Co., Selling Agents, Philadelphia, 1907.

The past few years have marked, in many states, a continual and increasingly vigorous fight for the enactment and honest enforcement of adequate laws regarding the employment of women and children. Nowhere has the campaign been more earnestly carried on than in Pennsylvania. This timely monograph, giving the history of the movement, is the work of an able student and teacher of sociology, who has given long and careful study to the subject.

As the title indicates the book is divided into two parts. Part I deals with the history of labor legislation, the early acts in regard to the employment of children, the passage of fire escape laws, attempts to regulate the payment of wages and prevent the abuse of the "company store" system, and the recent campaign against the employment of children in factory and workshops. Part II sets forth the administration of the various laws, the character of the present laws and their operation. An appendix outlines factory legislation in England in the years 1802 to 1847.

The concluding words of the monograph are devoted to an entirely too personal arraignment of the present department of factory inspection. In more than one instance the child labor movement has gained undesirable prominence through personal attack. The omission of the arraignment of Captain Delaney could have taken nothing from the value of the work; its inclusion seems a serious violation of the impersonal character traditional in dignified scholarly writing.

WALTER S. TOWER.

Brigham, Albert Perry. *"From Trail to Railway Through the Appalachians."* Pp. vii, 188. Boston: Ginn & Co., 1907.

This dimunitive volume is intended as a sort of collateral reader in the subject of geographical history—primarily for use by the older pupils in grade schools. It is essentially the history of the important routes across the Appalachians, over the Berkshires, through the Mohawk, the roads from Philadelphia and Baltimore and down the Great Valley to Kentucky. From the historical standpoint the book deals mainly with the progression of settlement from the coast to the western prairies. From the geographical standpoint it deals in a more or less cursory way with the broadest physiographic features of eastern United States. To quote: "The book is based on the conviction that geography in the grades must return to the human interest as against a somewhat exaggerated attention to scientific physiography. At the same time elementary history should be securely placed on its geographic foundation."

It is undeniable that both these conclusions are based on sound, logical principles; yet the question of solving the problem seems so far to have been adequately met by no one. The average geography for the grades is admirably well designed to give the wrong idea and impression concerning the earth in general. That this difficulty extends even into the high school and preparatory schools is only too evident. The ideal combination of intelligent earth study and human interest is still to be found. Most certainly is this fact true of the realm in which geography and history cross.

Professor Brigham has done much toward the desired result of linking historical events to the proper physical control or influence. It is to be regretted, however, that through it all there is an inharmonious vein of popular treatment—a sort of silent assumption that all phases of geography must be made entertaining, that they must be on the story book pattern or else no pupil will consent to study them. Mathematics, history, language study—none of all the other subjects of the grades are consistently "popularized." Attempts in that direction serve but to diminish the value of the day's work.

The argument is not for dry detail and technical physiography to the beginner. The argument is to have books of this kind written, not to entertain, but to convey the greatest amount of correlated information, be the emphasis geographical or historical, it matters little.

W. S. T.

Budge, E. A. Wallis. *Cook's Handbook for Egypt and the Sudan.* Pp. xxi, 911. London: Thos. Cook & Son, 1906.

The handbook includes "the principal facts relating to all the ancient monuments of Egypt and the Nile Valley." The book is in four parts. Part I outlines, in a readable way, the history of Egypt, and gives brief accounts of the civilization of ancient and modern Egypt. Parts II-IV are devoted to descriptions of the principal places where monuments of the ancient civilization are found.

The main addition to this second edition is in the description of recent development in Egypt and the Egyptian Sudan, along with the results of the latest archaeological investigations. Many illustrations and several maps help to make the volume useful, not only to the traveller but also to the general seeker for information concerning the most interesting of ancient countries.

Cappelle, H. Van. *Au Traverse des Forêts Vierges de la Guyane Hollandaise,* Pp. 198. Paris, 1905.

Under the auspices of the Dutch government and the Colonial officials in Surinam (Dutch Guiana), the author of this interesting book undertook to explore the rivers and virgin forests of Dutch Guiana. In an entertaining manner he describes the organization of the expedition, the intinerary and the equipment necessary for the exploration of a wild and unsettled region. The scenery of the country, the waterfalls, rapids and vegetation are reproduced in superb half-tone illustrations from the original photographs, while considerable attention is given in the pages of the book to the plants, animals and geologic formations.

Crouse, Elizabeth M. *Algiers.* Pp. 244. New York: Jas. Pott & Co., 1906.

This volume records the acquaintance made with Algiers and its people during a five months' sojourn, and sets forth enlightening delineations of the Algiers of the present day, with its somewhat complicated life and characteristics. It includes history and racial derivations, descriptions of customs, institutions, and architectural and other aspects of the place. The author's point of view is measurably contemplative, and she states her "first impressions" of the Orient, rather than furnishes a guide book or gazeteer. These impressions, replete with facts concerning the subjects dwelt upon, and at once illustrative and informing, constitute a sympathetic presentation of the history, mystery and romance of the place, and of existing conditions and features. The author's work has been discriminating, thoughtful, and restrained, and her spirit of profound interest in the subject pervades the volume. The book will appeal especially not only to those familiar with Algiers but to any acquainted with the regions of the North African coast. F. NORMAN DIXON.

Delevoye. Vaisseau. *En Afrique Centrale.* (Niger—Bénoné—Tchad.) Pp. 268. Le Sudier, 1906.

Gives a delightful account of an expedition sent by the French government to determine the existence of the waterway between the basin of the River Niger and that of Lake Tchad. To avoid the losses and fatigue incurred by land transportation, the practicability of using such water communication to provision the French colonies in that region was tested by the officer in charge. His tedious journey through rivers and lakes is well described, and many geographical items of interest and value are furnished. The success of the expedition is commented upon in a letter preface written by Lucien Herbert, député, and much praise is accorded to Delevoye for the scientific character of his work. The book is provided with a map prepared by the author, and it is illustrated by Charles Madvig. The appendix gives the astronomically determined positions of many places in the heart of Africa.

E. BELL.

Handbook for Eastern Africa. Uganda and Zanzibar. Pp. 300. Government Printing Press. Mombasa, 1907. English Agent, Thos. Cook & Son, London.

The book contains the usual store of detailed information characteristic of this class of publications, the main object of which is to advertise the particular locality discussed. A historical sketch, lists of officials, postal and customs laws, tariffs, land laws, money, insurance, telegraph and transportation facilities, fill the greater part of the volume. Sketches of the physical features, climate, resources and possibilities for development make the more valuable part.

Lying directly under the Equator, this East African district and its future is interesting as one of the large and most distinctly tropical possessions of Great Britain. The best commentary on the conditions presented there is found in a series of precautions to "intending settlers, sportsmen and tourists." The substance of the precautions is a partial admission of the fact that only with great care can a white man maintain his health. Even more interesting is the fact that it is still possible, within the space of a score of pages, to enumerate names and addresses of all the European residents in East Africa—an area of 1,000,000 square miles; less than 800 Europeans to some 5,000,000 natives.

A good index or a table of contents would add to the utility of the volume, which at best contains little of interest to the ordinary reader.

Keltie, J. Scott. *Statesman's Yearbook.* Edited by J. Scott Keltie. Pp. lxiv, 1604. Macmillan Co., 1906. Price, $3.00.

The wide scope and reliability of the Statesman's Yearbook long ago made it indispensable as a book of reference. With this latest edition, the editor has introduced a new feature which will make it of still greater general value. The innovation consists in the addition of some hundred and fifty pages devoted to the separate states of the United States. The publishers' explanation for the departure from former customs is that it "has been done partly to satisfy suggestions which the English editors have received from this country, and partly because it is considered that these component parts of the United States are at least as important as most of the component parts of the German Empire." The logic of this conclusion is made strikingly apparent by a few simple comparisons. Excluding Prussia—which is only half as large as Texas—five-sixths of our states are larger than the second German state, Baravia, and only three are smaller than the third German state, Würtemburg. Pennsylvania, only a third the size of Prussia, has a distinctly larger annual output of mineral products and is about equal in regard to manufactured products.

The comparative size and importance of the states of the United States with respect to foreign countries and their component parts are fascinating facts too commonly unrecognized by the average individual. The new departure in the Statesman's Yearbook is a decided step forward. The increased use of the book will undoubtedly justify the editors' action.

Kirchhoff, Alfred. *"Mensch und Erde."* Pp. 127. Leipzig: B. G. Taubner, 1905.

This interesting little volume about the earth and its influence over human affairs has proved popular enough to require already the printing of a second edition. It is almost amusing to note that in discussing separate countries the two chosen are "China and the Chinese," and "Germany and its people"—a prime reflection of the German mental attitude on more than one question. Written in German, it is, unfortunately, not available for all; but for the lover of German, the diminutive volume holds many minutes of interesting reading.

Le Roy, James A. *Philippine Life in Town and Country.* Pp. x, 311. Seventeen illustrations and maps. New York: G. P. Putnam's Sons, 1905.

The evident intent of this writer is to present an unbiased view of the situation in our eastern possessions. In his introduction he says that his "purpose is to set forth the Filipinos as they are, avoiding on the one hand psychological speculation under the guise of analysis of their characteristics, and on the other hand political propaganda in behalf of any theoretical plan for their future government or in behalf of the compromise plan under which they are at present being ruled." In this endeavor he has been measurably successful, and in addition has produced a readable work, which contains much relative to present conditions not generally known in America. Ethnology, religion, government, education, tribal and geographical influences, and development are all considered, and treated in an entertaining way. The anti-imperialists are charged with a lack of first-hand knowledge of the subjects as to which they unite, whilst the weaknesses of many who have taken the opposite view, are also pointed out. The German ethnologists come in for a measure of criticism. Full credit is given to the good results of Spanish influence. The illustrations are good, and the work satisfactory, notwithstanding its small scale, though the index is rather meagre.

George Vaux, Jr.

Pepper, Charles M. *Panama to Patagonia.* A. C. McClurg & Co., Chicago, Ill.

The author has given in an interesting form, his report of a trip down the west coast of South America, with a view of the industrial conditions of the countries bordering on the Pacific Ocean. The Panama Canal, when completed, will bring these lands into close proximity with the great seaports of the eastern United States and Europe and it is with a view of forecasting the conditions of these countries when the canal is opened, that this book is written. It gives an insight into the political conditions, which shows that the author was a diligent inquirer. The results of his investigations, which are apparently accurate, indicate most important industrial and economic development when the canal reaches completion.

Underlying the whole subject is the thought that the relations of the South American Republics and the United States may be strengthened and become mutually beneficial and so a western continental policy of development and self protection may be established and maintained. The book is an interesting one; and while it lacks the characteristics of a standard work, it is pleasant and instructive reading and clears away much of the doubt and ignorance regarding our neighbors of the southern continent.

Clarkson Clothier

Plate, A. G. *"Lloyd" Guide to Australasia.* Pp. 469. London: Edward Stanford, 1906.

Published for the Norddeutscher Lloyd, this book is designed to give briefly information on topics likely to be of interest to travelers in Australasia, Australia, Tasmania, New Zealand, British New Guinea and the German possessions in the western Pacific are the countries covered. The general plan is that common to most guide books, climate, industries, resources, sights worth seeing, travelling facilities, etc.—here, however, presented in an unusually attractive way. A number of excellent photographs, well chosen with a view to tempt the traveller, and an elaborate index complete a decidedly serviceable volume.

Potter, John W. *"Some Summer Resorts in the South of France."* Pp. 122. Galignani Library, Nice, 1905.

Ten years spent in the mountain districts of the Midi has admirably fitted the author for writing this volume which really amounts to a guide book for the prospective visitor. As the author states "Hardly any place in the south of France can be named as a desirable place of residence for the whole year." It is important, therefore, that information regarding the particular favorable season at different resorts should be available for all travellers. This volume deals with some twenty resorts, giving much valuable information concerning the atractions, hotels, principal points of interest and the like. For the traveller planning a sojourn in France this volume should prove very serviceable.

Sears, John Henry. *The Physical Geography, Geology, Mineralogy and Paleontology of Essex County, Massachusetts.* Pp. 411. Essex Institute, Salem, Mass, 1905.

This monograph of high scientific merit represents the results of many years of careful and thorough work. The author has long been connected with the Essex Institute, one of the foremost learned societies in the country, and by his untiring efforts has made himself familiar with every phase of the geology of the area. Eastern Massachusetts is far famed as a region of perplexing problems in geology and petrography, while the interpretation of surficial form is often no less complex. Essex County presents some of the hardest phases of areal work in all this difficult region. The work done and the time and patience necessary for the completion of such a thorough study as this by Mr. Sears, can be appreciated only by those who have worked in the same field.

The title outlines the general scope of the work. Two chapters are devoted to physical geography, seven chapters to geology and petrography, two chapters to glacial geology and one chapter each to fossils and minerals. The work is, therefore, mainly petrographical in character, and perhaps rightly so, since Essex County contains one of the most interesting petrographic provinces in the United States. The identification, analysis and correlation of rock types—confined almost entirely to the igneous rocks—has been done with much painstaking care. The chapters devoted to this phase of the work hold much of value not only to the petrographer and mineralogist, but also to the working geologist as well.

The chapters on physical geography and on glacial geology are especially thorough and valuable. Too much praise cannot be given the description of the Pleistocene deposits. These two chapters comprise one of the most thorough expositions of glacial action yet published. Accompanying the text are a great number of striking photographs of glacial features. In no text book of physiography or geology is there such a thorough illustration of the diverse glacial forms. They might well be taken as type examples, so carefully have the cases been selected and reproduced.

The discussion of the coast line topography brings forward many interesting and instructive facts concerning beach forms, wave and current action, and sand dunes. Here again a long series of illustrations makes the monograph of exceptional value as a reference book.

The work fully maintains the high standard of excellence for which the Essex Institute has always stood. It is a regional study of a type as yet all too uncommon in this country. Familiarity with the region described can serve only to add to the reader's appreciation for a thoroughly admirable scientific research.

WALTER S. TOWER.

Thomas, Wm. S. *Hunting Big Game with Gun and with Kodak.* New York: G. P. Putnam's Sons, 1907.

It was with considerable personal interest that I have read Mr. Thomas' book of the above title. It is a collection of stories of hunting trips in varied corners of our vast continent, and many of the sketches so vividly describe country over which I have passed frequently, that the book bears a double interest. That he loves the life is entirely evident; that he personally appreciates the scenes through which the reader travels, none can doubt; yet with his love of his work, with his advantages and opportunities, it is a pity he is not gifted with a more ready pen. The Virginia Mountains, the Mexican fastnesses, the Canadian Rockies—what more inspiring themes could a writer desire? The illustrations speak for themselves, telling not only the tale of the hills, but to him who has carried the camera too, a tale of patience, of fatigue, and final success. It takes but slight experience to realize that it is infinitely easier to bring down an animal with a rifle than with the camera, and the results the hunter in this instance has obtained deserves a vast amount of credit. Reading over this little book I am especially struck with the absence of one very important essential for handling the guides on whom health, happiness and comfort depend. Tact, on a long trail, is about as valuable as the flour and bacon supply, and is more often left behind than carried where it may be reached at a moment's notice. It frequently makes better companions of our paid assistants, and the sun to shine brighter and more often.

Like many another feast the last bite of our subject is the best. In that our writer frankly and shamelessly confesses that with all his experience, the actual killing of the beautiful creatures of the forest is not the lasting satisfaction it might seem to be. He says: "I have come firmly to believe that there is manifold more pleasure in hunting with a kodak than with a .30-30 repeater. Ambition is satisfied with the killing, but to the true lover of the wilds there is always a pang of sorrow."

MRS. CHARLES SCHÄFFER.

Toothaker, Charles R. *Commercial Raw Materials.* Their Origin, Preparation and Uses. Pp. 108. Boston: Ginn & Co., 1906.

The title indicates the scope and character of this manual compiled by the curator of the Philadelphia Museums. A great mass of concise, useful and valuable information is contained in the comparatively small space of this one volume. A comprehensive index and marginal paragraph topics in heavy type facilitate the use of the book in reference.

But there is in many cases much to be desired both in arrangement and in selection of facts incorporated. Under the heading rice, for example, one reads: "There are several important kinds in cultivation: common rice, swamp rice, upland rice, and glutinous rice." Obviously enough this classification is not scientific; neither is it clear or of any value to the lay mind. For almost anyone there must be confusion in trying to place the "common" and "glutinous" varieties if they do not grow either in swamps or on uplands. Again, under the heading of starch it reads that corn and potatoes furnish most of the starch used in America and Europe—but nothing is said in *this* paragraph about the use of starch. The following paragraph has the heading *Tapioca,* under which the uses of starch in general are grouped—very successfully hidden from the busy student who might be searching for just that particular point. Under the same head, *Tapioca,* one reads: "These roots (of the cassava plant) contain prussic acid, the same substance which occurs in the leaves of the sheep laurel." It is truly hard to see any connection between tapioca and sheep laurel, or to realize how that last clause is in any way explanatory of the character of prussic acid. It is all too obviously a case of "lugging in" a fragment of information which happened to be in the author's mind. Under the heading of *Whales* it is stated that "Whale oil or 'train' oil is divided into three grades," and that "the best is winter sperm,"—yet "whale oil" and "sperm oil" are trade terms for distinctly different products which through two centuries have never been regarded as interchangeable any more than gasoline and kerosene would be used as synonymous.

WALTER S. TOWER.

Wordsworth, William. *Guide to the Lakes.* Fifth Edition (1835) with an Introduction, Appendix and Notes (textual and illustrative), by Ernest De Sé'lincount, with a map and eight illustrations. London: Henry Froude, 1906.

To many students of the poems of William Wordsworth, it will come as a surprise to know that he was the author of this excellent guide book, into which he has written his love of, and admiration for the English Lake country.

It is a poet's book, alive with the joy in nature and her gifts. Lakes and mountains, storm and sunshine, winter and summer, all have their message to him, and each a place in the "out of door" spirit that pervades the book.

The present edition is a reprint of that of 1835, and is made further interesting by copious notes and appendices.

Fiala, Anthony. *Fighting the Polar Ice.* New York: Doubleday, Page & Co., 1907.

Never was there a book with truer name for the Feight Polar Expedition from start to finish had an unending battle with ice in all its phases, and only a commander like Mr. Fiala could have succeeded in doing such good, true work, even if the goal hoped for was not to be theirs.

Thirty-nine men left Norway in the ship "America" in the early summer of 1903, bound for Franz Josef Archipelago, where, from a camp on one of the most northern islands, it was planned to reach the Pole, or at least gain a point further north than other explorers.

Ice of unheard of quanities, with dreadful storms made the voyage a slow one, and all were thankful to reach Teplitz Bay. The comfortable camp was established and named camp Abruzzi. The expedition was finely equipped by Mr. William Feight. Ponies as well as dogs were taken for the sledge journies and were found invaluable. The loss of the ship in so early a part of the expedition was a sad event, and the description of the weeks of squeezing of the ice, and the final and most mysterious disappearance in the darkness and storm is thrillingly described.

The winter was spent in hard well-planned work by all the party preparing for the spring trips north, but their ever present enemy always making it impossible to succeed. Summer came again, and yet again before these brave men, and their commander with his never-give-up courage and love for those under his care were rescued by the relief party under Mr. W. L. Camp.

As the book comes to a close the reader is almost sorry. Too interesting are the days of travel and adventure in this far north land. The appendices show the large amount of scientific work done, and the valuable suggestions from Mr. Fiala after his years of experience spent in the Arctic regions cannot but prove helpful to the brave souls who will try again and again for the prize that seems almost unattainable. Over one hundred and sixty photographs and sketches deserve special mention, adding much to the book. The whole making one of the most thrilling and interesting works on Arctic research ever written.

SARAH W. BONSALL.

GEOGRAPHY OF VIRGINIA.[1]

G. T. SURFACE, M.Sc., Ph.D.

INTRODUCTION.

Virginia has been studied thoroughly and enthusiastically by the historian, and her place and importance in history is generally recognized. The geography of the State has, however, received but little attention in the way of systematic research or description. The current discussion is only intended as a preliminary study, and is presented for the purpose of acquainting the reader with the most salient and apparent characteristics of Virginia geography. The author desires that each reader shall feel free to offer both criticisms and suggestions, to the end that the public may ultimately have an accurate and comprehensive statement of the State's geographical features and facts.

In the following pages I shall purposely avoid technical phraseology; and since the numerous teachers of general geography are likely to be benefited more than the few specialists of the different divisions of geography, the differentiation adopted is based upon a concrete statement of the whole, rather than an analytical interpretation of the parts. Geographic classification is destined to be greatly modified, and since some of the fundamental divisions have not been clearly defined in the majority of American text-books, it would not be judicious in this limited discussion to attempt the projection of a scientifically comprehensive classification.

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[1] Parts of this discussion have previously appeared in the BULLETIN of the American Geographical Society, and are reproduced by the permission and courtesy of the Society.

Historical Notes.

The first Virginia colony was planted by Sir Walter Raleigh in July (13?), 1584, on Roanoke Island,[1] situated near the mouth of Albemarle Sound, 34° N. Latitude. Raleigh entered possession in the name and right of the Virgin Queen Elizabeth. They found on the island deer, rabbits and fowls, and on the mainland melons, walnuts, cucumbers, peas and grapes. So great and disastrous were the hardships experienced from the attacks of the natives and the lack of food supplies during the winter, that the surviving members departed for England in August, 1586. During the succeeding twenty years no further attempt was made toward colonization. The next expedition was backed by the merchants of London, Bristol, Exeter and Plymouth, and promoted for commercial ends. The charter secured by the London Company was granted in 1606 under James I, and constitutes the First Virginia Charter. It included all territory between 34°-45° N. Latitude, and all adjacent islands. The expedition was headed by Captain Christopher Newport, who set sail December 20, 1606, and arrived at the mouth of Chesapeake[2] Bay, April 26, 1607. He landed on the Cape and built a fort, naming both after Prince Henry. This was only used as a camp while selecting a suitable place for the establishment of the colony. The ease with which it could be protected from the Indians represented the chief essential. Near the mouth of the largest river which had been sighted from the bay they found a headland projecting into the river, and connected with the mainland by a small isthmus. On the three water-front sides a surprise attack was impossible and repulsion easy. The narrow land connection could be advantageously fortified by stockades and forts. This position they selected, and on May 13, 1607, landed, and planted the first *permanent* English colony in Virginia, which they named Jamestown.

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[1] According to Hariot's Treatise and With's map (both men were members of the expedition) they landed first on an island called by the natives Wococon, a small island off the coast between Cape Hatteras and Cape Fear. After a short sojourn here they set sail up the River Occam, and the next evening landed upon Roanoke Island at the mouth of Albemarle Sound. Stith's History of Virginia, p. 10.

[2] The name of the native tribe bordering the lower bay, and of an Indian village on the Elizabeth River near the present site of Norfolk. This village was visited in 1585 by the colonists of Roanoke Island.

Captain Newport left June 22d, of the same year, with a cargo of sassafras and pine wood for wainscoting, the first export shipment of Virginia products. It was the hope of securing from the colonists such products as were English imports that led the British merchants and manufacturers to supply money for the expedition and the maintenance of the colonists. The most important imports were: iron and steel from Spain; copper from Sweden; wine, salt and canvas from France; silks and velvets from Italy; spices from Asia; and tar, pitch, cordage, masts and yards from Russia and Poland. The colonists began certain manufacturers during the first year of their residence at Jamestown. The first attempts at manufacture are set forth in Captain Newport's message of 1608 to the Royal Council of Virginia sitting in London, from which we quote: "In their absence (the boats, which had been sent with a cargo of wood) I followed the new begun works of pitch and tar, glass, soap ashes and clap-boards."[3] So far as the record shows lumber products were the only important shipments during the first decade of the Jamestown colony. Captain John Smith was the only man in the colony who could inspire the colonists to perseverance. He was equal to the task when present, but his great desire to find a river flowing into the South Sea kept him almost constantly on exploring expeditions. It is stated that he was at Jamestown but three days in three months during the summer of 1608. He was the *geographer* of the Virginia colonists, and made the first map of Virginia. In September, 1609, he visited the great Chief Powhatan at *Werowocomoco*, a village on the north bank of Pamaunke (York) River, for the purpose of delivering presents from the King. In the course of the interview he asked Powhatan about the country beyond the mountains, occupied by the powerful Monacans; and especially as to where *salt water* could be found in that direction. Powhatan declared with emphasis that there was no salt water beyond the mountains, and drew on the ground a map of that region. We may believe that it was very convincing to Captain Smith, as his further explorations were chiefly confined to the Chesapeake Bay and its shorter tributaries. Smith's map of Virginia was based upon personal observations and the information supplied by Powhatan. By means of pictures he depicted the game resources, which were to the early settlers one of the important resources. While Smith was exploring the Tidewater country, most of the colonists at Jamestown were engaged in gathering "gold dust," with which the return vessels were loaded; but on their arrival in England it proved to be "fool's gold," being nothing more than micaceous earth brought down by the streams from the crystalline rocks of the eastern Piedmont region.

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[3] Smith's Works, p. 442.

Prior to 1609 Smith had established three settlements: Jamestown, the seat of the colonial government; Nansemond, about thirty miles below Jamestown; and Powhatan, six miles below the James (Powhatan) River Falls. One hundred and twenty men were allotted to each, and the industrial operations radiated from these centers. We may feel sure that the early promoters were strongly imbued with the modern "boom" idea, from the number of cities which were founded only in name—James City, Elizabeth City, Charles City, City of Henricus (Henricopolis). The agricultural development decreed the conquering of the wilderness, and the names of the imaginary cities survived as the names of counties, the City of Henricus[4] being changed to Henrico. A reference to the map will show that each of these counties had a water-front on at least two sides. In fact, streams constitute the political boundaries of the counties of Tidewater Virginia to an extent not to be found in any other state.

Almost every plantation could be reached directly by boat. Although Captain John Smith left Virginia in 1614 not to return, he predetermined the sections most favorably situated for successful occupancy by the methodic study and careful observations made during his frequent river expeditions. His economic deductions were largely based upon what he saw. The condition of the Indians gave the most reliable evidence as to the resources immediately available. He found the tribes of the Lower Potomac[5] and Rappahannock comfortable, and surprisingly peaceable. The tribes were also far more numerous, being thirty-four tribes north of the Rappahannock, and only nine on the south side.[6] The superior oyster fisheries of the rivers and the neighboring Chesapeake Bay waters made possible the friendly social relations, by making easy the struggle for existence. Port Royal (Caroline County) was the terminus of the oyster beds. Fishing was not good above that point, and the stony land precluded cultivation with the wooden and stone implements, as a result of which we have no record of an Indian tribe residing permanently in the region. The tribes met with in the neighborhood of Fredericksburg (Spottsylvania County) and Falmouth (Stafford County) were representatives of the implacable warriors of the stony interior region; which affords a striking proof of how much of the treachery and barbarity of primitive peoples is impressed upon them by the severity of the conflict for existence, in which only the strongest, shrewdest, and most daring can survive.

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[4] Henricus, founded in 1611, was located on Farrar's Island, as the peninsula was called (near Appomattox, Chesterfield County).

[5] The Indian name for the upper Potomac was Cohongoruton. It is so named in the Act of 1738, defining Frederick County. The south branch of the river was called Wappatomake. Lord Fairfax used the name Potomack and Wappatowmack, and Cohongoruton disappeared.

[6] Smith's Map of Virginia.

The Indians of the "Northern Neck" country being friendly, their presence presented an additional inducement to English settlers, by reason of the profits to be realized from their trade. It was in this region that the next English settlements were founded.

The second charter, known as the "Virginia Charter of 1609," was granted in 1609. It included 200 miles along the seacoast northward and southward, "from the said point of Cape Comfort" "through from sea to sea," and all adjacent islands. It was in this same year that hogs were introduced from the Bermudas, and sheep, horses, goats and poultry from Europe. In the following year cattle were introduced from the West Indies. The extended use of meats made salt a much needed article, and to meet the demand Sir Thomas Dale, deputy governor of the colony, detailed a party in 1612 from the Jamestown colony to go to the Kingdom of Accawmacke (Accomac) to manufacture salt by boiling sea water. This first settlement on the Eastern Shore was named Dale's Gift, and because of the island's separateness from the other colonists, the Kings of England for many years addressed all decrees to the "faithful subjects in ye colonies of Virginia and ye Kingdom of Accawmacke."

In 1611 or 1612 the Third Virginia Charter was granted, to include all territory between 30°-41° N. Latitude.

John Rolfe (who was married to Pocahontas in 1614) began the cultivation of tobacco[7] in 1612. Sir Thomas Dale was at this time deputy governor, and he enacted a law requiring that the cultivation of corn should take precedence over tobacco. He was succeeded by Captain Yeardley in 1616, who encouraged the tobacco industry, to the neglect of all others. So great was the demand in England that, in 1619, the King placed a duty of a shilling per pound on tobacco, when the market price was only five shillings. The charter, however, called for exemption beyond five per cent, and settlement was effected by a compromise, in which one of the considerations was that the cultivation be forbidden in the Kingdom. In 1621, a monopoly[8] of the tobacco trade was granted to certain individuals, at whose request a proclamation was issued, limiting exportation to 55,000 pounds. The close of the year showed the market to be overstocked, and the King advised the colonists to turn their attention more to the cultivation of corn and the raising of stock. To this end the tobacco crop was limited to 100 pounds per man. The introduction of slavery in 1622 fostered the tobacco industry still more, to the almost suppression of all others. The situation was critical, and to meet it the Assembly enacted laws authorizing the following bounties: two pounds of tobacco for every pound of flax or hemp ready for the spindle; three pounds for every yard of linen cloth a yard wide; five pounds for every yard of woolen cloth made in the province; and ten pounds for every dozen pairs of woolen or worsted stockings. The legislature of 1623 ordered settlers to plant mulberry trees; and in 1656 an Act was passed imposing a fine on every planter who failed to have one mulberry tree to every ten acres of land in his possession, but the labor surplus was inadequate for the silk industry, even if all other conditions had been favorable. The tobacco industry flourished more and more after 1616. The raw and manufactured products most desired by the promoters of the colonies, either proved unprofitable or impracticable.

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[7] Indian name, *Uppowoc.*

In 1620, iron mines were opened at the James River Falls, but abandoned because inferior; the grape was neither adapted to the climate nor soil; great difficulty was experienced in supplying the domestic demand for salt; the silk industry was then, and has ever been impracticable, because of non-adaptability of climate and lack of labor supply; and the great cost of transportating timbers made it impossible to compete with closer markets. Virginia's only hope, therefore, was to create a new demand, of which a surplus could be produced, for the purchase of the numerous supplies necessary to every country in the establishing stage. Fortune crowned the crisis in the introduction of tobacco. It is for this reason that tobacco has been called "king."

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[8] This was the first tobacco trust organized in the history of the world.

It seems timely here to inquire into the economic foundations of Virginia society, which has always been a type of Southern society, and why it so radically differed from that of New England. The social status of any differentiated society or community is fixed by the elemental habits and characteristics of the individuals comprising the group; and by the environment—the objective forces brought to bear on the subjective individual. Of these forces, the geographic conditions and the economic relations are by far the most important. Let us first inquire into the nature of the individuals. The early Virginia colonists were essentially of the English gentry on the one hand, and of the free and bond servant classes on the other, with a few who could lay claim to the nobility. This condition existed because the enterprise was primarily commercial, and, in consequence, appealed to the moneyed interest; which in turn required labor for carrying out its purposes. The promoters had neither political nor ecclesiastical grievance, and were not bound by the stress of poverty, so they adhered to their old habits, manners, tastes and styles of living, in so far as the new conditions permitted. The same strict adherence to the Church of England, and largely to the Crown, was also maintained for more than half a century. The plantation owners prospered, and increased in influence in the political arena to a position which they had found impossible in the mother country. The whole tendency was toward the establishment of large holdings. The extreme eastern coast was malarial, while farther inland the climate was healthful, the soil fertile, and an abundance of game, which feature alone was very inviting to the English *gentleman*. England pushed slave labor into the colony as rapidly as it could be utilized. The dissolution of the Company in 1624 augmented the tendency to large estates, as its policy had been restrained in a measure, by making the landowners of two kinds—the planter, who held grants of land proportionate to his contribution of money and emigrants; and the small holder, who received an allotment as remuneration for working on the Company land during a certain period. On the dissolution no change was made in the tenure, except that the free emigrant had to go out at his own expense, and bound in an agreement to bring the land under cultivation within a certain period, or forfeit the right of ownership. Under this régime the yeomanry class did not progress, for the reason that they lacked administrative ability; and having grown accustomed to routine labor and dependence, became easily discouraged under the pressure of poverty, responsibility, and the stronger external hand of the landed aristocracy. Becoming poorer, they became free servants.

The increased prosperity of the planter prompted to a life of ease and independence. In most cases he was not even placed under the necessity of finding a market, or of concerning himself as to the ways and means of securing supplies, since foreign vessels loaded with a variety of merchandise came up to the plantation wharves to exchange their goods for tobacco. So satisfactory were the returns of soil tillage that the manufacturing enterprises were not prosecuted assiduously, except for those which could be done at home, by way of utilizing the surplus labor. The attitude of the representative planter is vouched for in the words of Thomas Jefferson: "Such is our attachment to agriculture, and such our preference for foreign manufactures that, be it wise or unwise, our people will certainly return to the raising of raw materials, and exchange them for finer manufactures than they are able to execute themselves. The political economists of Europe have established it as a principle that every state should endeavor to manufacture for itself, and this principle, like many others, we transfer to America without calculating the difference of circumstance which should produce a difference of result."[9]

I have not heard the opinion expressed, but I believe that slavery exerted a characteristic influence on Virginia society as marked as was its influence on the industrial system. It should be remembered that up to this time the great majority of those who had set the pace of a social system so individualistic as to stand out for generations as characteristic of the typical Virginian were slave owners and slave workers, and not slave traders. Most of the slaves of this larger class felt themselves not only a constituent part

[9] Jefferson's Notes on Virginia, p. 225 (1781). After the rupture with England, manufacturing was much more emphasized than before. The domestic wants were largely supplied by home manufacturers, until the development of factory enterprises in New England, which were not extensive at the time Jefferson wrote his "Notes on Virginia."

of the plantation, but an indispensable part; and so they were, under the existing régime. This accorded to the servant a feeling of self-importance, which found its counterpart in the personality of the master. The plantation equipped with a full retinue of servants and slaves felt that it was a sufficiency unto itself, which, to an extent incalculable, fostered the tendency toward seclusion, and intensified the ultra-individualism of the cavalier type.

Prior to 1688 Virginia adhered strictly to the Church of England, even to legislating against the Puritans, Quakers, and Separatists; and contested vigorously the position of the Presbyterians within her border. But while this ecclesiastical attitude had been maintained, and its power exercised, the idea of civil liberty was gaining strength in many parts. This had been brought about in part by oppressive taxation, and the indirect connection of the House of Burgesses with the Crown; but in an important sense through the influence of that prosperous, free, easy, isolated, independent life. As the civil attitude changed, the loyalty to the Established Church began to weaken. In 1696 a law was passed fixing the salary of every clergyman at 16,000 pounds of tobacco. The price so fluctuated that this made the salary quite variable. In some parishes only "Orinoco" could be raised, which was inferior to "sweet-scented." The books of that time bear frequent reference to a promotion from an "Orinoco parish" to a "sweet-scented parish," Where tobacco was not grown the Established Church was without representation, and it was "in the tobaccoless wilderness voices were heard of the Baptists, Quakers and less definable dissenters, who were directing the pioneer axe to the root of the established tree that protected the throne."[10]

The House of Burgesses passed an Act in 1755 enabling debtors to pay their tobacco obligations in money at the rate of 16s. 8d. per hundred pounds. The price of tobacco rose by reason of the drought, and many clergymen demanded payment in tobacco. A number of suits were instituted during the succeeding years, the final one being the appeal of Rev. John Camm to England in 1767. This case was heard before Colonel John Henry, the father of Patrick Henry. Patrick Henry had always been loyal to the Church and the Crown, but he grew so indignant over these controversies, that he flamed out in such an arraignment of the clergy as to break the authority of the Established Church, and thus became the herald of the people's rights. As a result he was ardently supported when the Stamp Act agitation arose.[11]

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[10] Barons of the Potomac and Rappahannock.

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The mountainous portion of the State was destined to produce a different type of society. We have seen how distinctly different were the characteristics of the Indians of the western part of the State (Monacans), and the eastern tribes. During the first century of Colonial history no attempt was made toward settlements in the mountains. They were not adapted to the use of slave labor, were frequented by the most treacherous Indians, and so remote from market and void of transportation facilities as to be wholly impracticable for occupation.

The competition of slaves was very irritating to the free laborers of the East, and it was difficult to obtain small holdings, so dominant and domineering was the influence of the large owners. As a result, the bravest, strongest and most resolute of the free laborers forced their way westward and joined the Scotch-Irish Presbyterians,[12] who were coming in large numbers to the Valley as well as to the Piedmont frontier. These were the mountaineers of the eighteenth century, but must not be confused with that class known as "poor whites," either according to present or past acceptance of that term. It is true many of them were poor in possessions, but rich in valor, and came from the great middle class who had tired of landlord oppression in England, and slavery competition in eastern Virginia. The indolent, thriftless, lower class followed in their wake, but at a safe distance—far enough removed from the old settlements to eke out a bare existence by hunting and little work. On the mountains they remained in preference to subduing the great forests of the fertile intervening valleys, and there they are for the most part to be found to-day. In the middle of the eighteenth century the life of western Virginia compared with that of Tidewater as does the ranch life of the Rocky Mountains and the Plains with modern New England society life. From the first it was a life-and-death struggle, in which the weaklings were sure to go down. No man could stand alone, and so by ties of mutual sympathy and protection they were united in hearty, unselfish fellowship. As a class they were clannish, and more or less superstitious; loyal in their friendships and inexorable in their hates, but brave, just, generous, and industrious. It was these iron-nerved, steel-sinewed stalwarts, who formed a line of mountain outposts between the older settlements of the coast and the treacherous Indian tribes of the west. Not only did they drive the savages beyond the mountains, but followed them into the plains, and broke for all time the powerful confederacy. It was also these who, in that memorable battle of King's Mountain, turned the tide of the Revolution. They represent to-day a reserve force in the nation, whose vitalizing lines are found to connect with all the throbbing centers of educational, commercial, and political activity.

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[11] The American Revolution really began with the resistance of the colonies to the irritating duties and regulations imposed by the Crown on the cultivation of tobacco.

[12] See chapter on Population.

Location, Boundaries and Natural Divisions.

Virginia is situated between 75° 20′-81° 20′ West Longitude in its east and west extension, and 36° 30′-39° 25′ North Latitude in its north and south extension. In the western hemisphere northern Oklahoma, northern New Mexico, southern Kansas and southern Colorado, have the corresponding latitude; and in the eastern hemisphere northern Africa, southern Spain, Central Thibet and Japan have the corresponding latitude. With reference to the major physical boundaries of the eastern United States (Atlantic Ocean and Appalachian Mountains) the State occupies a central position.

The Atlantic Ocean, Chesapeake Bay, and Potomac River constitute the eastern boundary; and the Cumberland Mountains, Alleghany Plateau, Shenandoah Mountains, and North Mountains, constitute the western boundary. The State boundary line on the east, north and west is in consequence very irregular. The southern boundary line is not fixed by natural barriers, and is comparatively regular.

The present territory of West Virginia constituted the three Northwestern Virginia Senatorial Districts prior to the rending of the State June 20, 1863,[1] so that the present western boundary of Virginia formerly represented the southern boundary of these Senatorial Districts.

Physical Features.

An examination of the physical features of Virginia shows them to be varied in type, comparatively regular in form, and somewhat consecutive in distribution. A thorough study of Virginia's topography would leave but few types to be studied elsewhere, since a traverse along the southern border from east to west will either cross or touch a lowland plain, an upland plain, a broken plateau, mountain foot-hills, a distinct mountain ridge, major and minor valleys, a typical mountain range, and a highland plateau.

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[1] Constitution framed November, 1861, to February, 1862. and ratified by the popular vote in April, 1862. Bill for admission of the state passed the United States Senate July 14, 1862, and West Virginia formally inaugurated June 20, 1863.

Geographic Divisions.

Five distinct geographic divisions can be recognized, each of which has a general northeast and southwest direction, as fixed by the Atlantic coast-line on the east, and the Appalachian Mountain System on the west.

Natural Divisions.	*Area in Sq. Miles.*
1. Tidewater	11,000
2. Piedmont	18,000
3. Blue Ridge	2,500
4. Valley	5,000
5. Appalachian	5,400

These divisions succeed each other in parallel order, and are characterized by a general increase in elevation from the sea westward. A knowledge of the geological structure and history of the different geographic divisions will increase greatly the accuracy of the topographic study, but it is beyond the province of this article to enter that field.[2]

Tidewater.

As the name would indicate, this is that portion of Virginia territory which constitutes a part of the Atlantic Coastal Plain. It is an irregular quadrilateral in shape, averaging 114 miles in length from the north to south, and ninety miles in width from east to west, and includes an area of about 11,000 square miles. On the south it borders North Carolina for a distance of 104 miles; on the east it is bounded by 1,500 miles of tidal shore-line on the Atlantic Ocean, Chesapeake Bay, and the Lower Potomac River,—or one mile of shore to every $71^1/_3$ square miles of territory. The continent of Europe has one mile of shore-line to every 191 square miles. The western boundary is marked by that line of sudden topographic change known as the "fall-line," where the streams emerge from the hard crystalline rocks of Piedmont, on to the soft sedimentary deposits of the Coastal Plain. The great number of bays and estuaries are of comparatively recent origin, having been formed by the gradual subsidence of the Coastal Plain region, by which the rivers are drowned in their lower course through the transgression of the ocean. The Susquehanna River formerly entered the ocean east of Cape Henry, and the Potomac, James, York and Rappahannock were its important tributaries. The continued depression converted the lower Susquehanna Valley into the Chesapeake Bay, and embayed the mouths of the lower tributaries, making them tidal streams. Accomac and Northampton Counties became thereby separated from the mainland.

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[2] The reader will find a geological treatment of this subject in BULLETIN of American Geographical Society, December, 1906, Physiography of Virginia, G. T. Surface.

The effect was to make all of the important streams navigable in the Coastal Plain part of their course, and it gave to the state in the formation of Hampton Roads (estuary at the mouth of the James River) the finest American harbor.

The elevation increases from sea-level to 150-300 feet on the western border. From the surface configuration the land is commonly designated as *first* and *second bottom,* and the *ridge country*. The *first bottom,* where protected from the tide, is very productive. It is in this portion that most of the swamp and marsh lands occur, all of which are covered with a variety of swamp and marsh grasses, which are partially utilized for grazing. Wherever this has been reclaimed it is exceedingly productive, Dismal Swamp[3] being the most notable example. No survey or special study has been made of these wild lands, but there is no doubt but that hundreds of square miles could be reclaimed at a cost which would leave a wide margin of profit.

The *second bottom* is also alluvial, and is the most valuable part of Tidewater. The subsoil is a dark red or yellow clay, with a moderate mixture of sand. The surface soils consist of sandy loams, which vary in color and consistency according to the mineral and vegetable matter predominating. The *ridge country* has an elevation of 90 to 300 feet above sea-level. The soil is a light sand, easily eroded, and intractable to most methods of improvement. This section involves one of the most important economic problems in the state. Calcareous marls have proved very beneficial, and it is believed by some fertilizer authorities that most of the area can be brought into a state of at least fair productivity.

Piedmont.

The "fall-line," previously mentioned, which marks the western boundary of the Coastal Plain, is the eastern boundary of Piedmont. That part of the Piedmont region situated between the head of tide and the foot of the low broken ranges, Catoctin, Bull Run, Yew, Clark, South-west, Carter, Green, Findlay, Buffalo, Chandler, Smith, etc., has been described by some writers as a separate natural division (Middle Virginia). The physiographic break is, however, not prominent; and in our opinion does not justify a paramount differentiation. For this reason the region east of the above-mentioned minor ranges will be herein designated as *Eastern Piedmont,* and the portion situated between these ranges and ridges, and the eastern base of the Blue Ridge as *Western Piedmont.* The Piedmont area consists for the most part of crystalline rocks, and marks the axis of the old Appalachian System of the Archaean Era, whose ranges were 10,000 to 40,000 feet in elevation. The Piedmont Plateau is therefore the result of denudation and re-elevation. It varies in elevation from 150-300 feet on the east, to 700-1,200 feet along the Blue Ridge border. The streams cross it almost at right angles, in a general southeastern direction. The most important of these are the Roanoke, Nottoway, Appomattox, James, Pamunkey, Rapidan and Potomac Rivers.

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[3] Dismal Swamp marks the southern limit of the bog mosses (Sphagnei) which are common further north, and the northern limit of the dwarf palmetto.

Eastern Piedmont.

The general form of this area is that of a right-angled triangle, its base resting on the North Carolina boundary line; its perpendicular a line 174 miles in length, extending from the North Carolina line to the Potomac River; and the hypothenuse, 216 miles in length extending along the western Piedmont border. Passing from north to south the topography becomes more irregular and broken.

Western Piedmont.

This area extends from the Appalachian outlines above-mentioned, to the eastern base of the Blue Ridge. It varies in width from twenty to thirty miles, and extends from the banks of the Potomac on the Virginia-Maryland line to the banks of the Dan River on the Virginia-North Carolina line. The portion situated south of the Roanoke River is quite rugged, and suggests but little of plateau topography.

Blue Ridge.[4]

This stands out as the most conspicuous and persistent of the natural divisions in the state, being a continuous barrier from the Maryland boundary to the North Carolina boundary, excepting an occasional water or wind gap. With an elevation of 1,460 feet at Harper's Ferry, where the Potomac River breaks through the Blue Ridge, it increases southwestward to 4,001 feet in Bedford County (Peaks of Otter), and reaches a maximum of 5,700 feet in Mt. Rogers, Grayson County, Virginia. It is three to twenty miles in width. The southern portion expands into a fan-like plateau, which is the watershed for the waters flowing into the Atlantic Ocean and the Gulf of Mexico. This fan-like expansion includes the counties of Floyd, Carroll, Grayson, and a portion of Franklin and Montgomery counties. Almost the whole of the plateau is drained by New River, which flows northeast through a winding gorge valley, whose position was established at a stage of advanced erosion, when the whole Appalachian area had been reduced to a peneplain. The only other important streams crossing it are, the Roanoke, James and Potomac Rivers, which in this part of their courses flow in narrow and precipitous gorges.

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[4] The early colonists gave it the name of Blue Mountain, from its appearance in the distance. During the first half century of Virginia colonization the inhabitants believed it to be impassable.

The Valley.

This is a continuation of the Great Valley of east Tennessee, and becomes the Cumberland Valley in Maryland and Pennsylvania, the Kittatinny Valley of New Jersey, and the Newburg part of the Hudson River Valley in New York. It is the central part of the Greater Appalachian Valley, as described by Willis, which includes the Blue Ridge, the Valley, and the Alleghany Ridges. The Valley region is that which lies between the western base of the Blue Ridge and the eastern base of the Alleghany Front. It is 15 to 40 miles in width, and 230 miles in length, making an area of about 5,000 square miles. It consists of the following minor valleys: The Shenandoah, 106 miles; James River, 50 miles; Roanoke River, 38 miles; New River, 54 miles; and Holston River, 52 miles. For the purposes of convenience we may recognize three general sections: The northern, or Shenandoah Valley section, the central, embracing that region between the headwaters of the Shenandoah and the Holston Rivers, which is cut by the transverse valleys of the James, Roanoke and New Rivers; and the southern section, that part drained by the Holston River.

Viewed topographically, it is a broad, gently rolling plain, with the floor dissected by minor drainage systems. The elevation increases southwestward and westward, being 242 feet above tide at the mouth of the Shenandoah, and 1,687 feet where the Holston River crosses the state line.

The soil of the valley is prevailingly limestone, and it is by far the most productive of the natural divisions. George Washington[1] realized its great possibilities when he wrote: "In soil, climate and production, in my opinion, it will be considered, if it is not considered so already, as the Garden of America."

Settlements were made in the region as early as 1732. Several of the earlier ones were exterminated, but the natural conditions were so favorable that each depredation by the Indians inspired the settlers to stronger and more persistent resistance.

The position of the valley topographically marks it out as a natural transportation route, so we find the Norfolk and Western Railroad traversing it from Bristol, which is on the Virginia-Tennessee line, to Roanoke; from this point the Shenandoah Valley extends to Harper's Ferry, on the Virginia-West Virginia-Maryland line.

Appalachia.

This is the most irregular of the natural divisions both in boundary and physical features. The eastern boundary is in general formed by Walker, the North Mountains; while the western is formed by the Cumberland, Black and Flat Top Mountains, south of the New River divide; and by the Alleghany Mountains,—or the Alleghany Front—north of the divide. It consists of a series of ridges of northeast-southwest direction, alternating with narrow trough-like valleys.

This irregular belt is 260 miles in length and 10 to 50 miles in width, with an approximate area of 5,725 square miles.

The counties can be provisionally grouped with reference to their drainage system as follows:

1. James River Group, including Highland, Alleghany and Craig Counties.
2. Kanawha or New River Group, including Giles and Bland Counties.
3. Tennessee River Group, including Tazewell, Russell, Lee and Scott Counties.

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[1] Letter to Sir John Sinclair, 1796.

4. Sandy River Group, including Buchanan and Wise Counties, which topographically belong to the Alleghany plateau region.

This area embraces the region between the Valley and the Alleghany Front, which is the eastern border of the Alleghany Plateau, and is made of a series of ridges of northeast-southwest direction, alternating with narrow trough-like valleys. This general topography is interrupted where intersected by the transverse valleys. An examination of the ridges shows a remarkably accordant topography. They are believed to be the remnant of the plain of advanced topographic maturity formed during the Mesozoic era, which was continuous from Piedmont to the Alleghany Plateau, called by Davis the Schooley Peneplain, and by Willis the Kittatinny Peneplain. The region under discussion has been reduced to its present topographic condition since the Jurassic period by denudation and periods of elevation.

The ridges owe their elevation chiefly to the fact that the carboniferous conglomerates and sandstones were depressed below the general level of the Kittatinny Peneplain, and thus escaped being worn away during the production of that feature. Subsequent elevation and denudation have removed the weakened anticlinal rocks, and left the synclinal remnants of hard sandstone standing out in relief, as protecting caps to the softer strata beneath.

Like the land of the Valley, the Blue Ridge and the Alleghany Front, these ridges increase in general elevation southward. Many of them exceed 3,000 feet. Elliot's Knob, twenty miles west of Staunton, has an elevation of 4,473 feet.

The Appalachia and Valley topography of southwest Virginia has been materially influenced by a series of faults which produced a displacement of 500 to 12,000 feet. The most important we may designate the Saltville or North Holston fault, with a maximum displacement of 10,000 feet; the Walker Mountain fault, with a maximum displacement of about 10,000 feet, and seemingly continuous with the Great Fault of Northern Virginia; and Draper Mountain fault, which by a maximum displacement of 12,500 feet, brings up the Lower Silurian in Wythe and Pulaski County as a rugged mountain in the heart of the Valley. Two cross-faults pass from it, the Max Meadows in a westward direction, and the Pulaski in a northwestern direction, toward the Walker Mountain fault; so that in the very heart of the Valley there is a block of Upper

Silurian, Devonian and Lower Carboniferous, with Lower Silurian on two sides, Cambrian on the third, and Lower Carboniferous on the fourth.[6]

The soils of the upper slopes are usually sandy and sterile, being derived from the heavy siliceous sandstones and conglomerates. Beneath these strata occur the softer shales, some of which (the most calcareous) form fairly productive soils. The residual soils from limestone are always fertile, but most of the limestone strata have been removed by denudation.

Because of the very broken topography common to the region, it is best adapted to grazing. The narrow valleys are made up of sandy calcareous alluvium, with often a strong impregnation of iron, and are productive. Cultivation is concentrated on the valleys and lowlands.

More virgin forests survive in this belt than in any other part of the state, because of its inaccessibility. With the superior water power, which abounds throughout the region, the manufacture of hardwood products should become an important industry.

This is the most productive region of the state in mineral resources.

The bold southeastward-facing escarpment of the Alleghany Plateau border constitutes the western border of the Alleghany trough. The state line is approximately marked by it, except in the southwest corner.

From Little Knob (twenty-six miles south of the Potomac, on the Virginia-West Virginia boundary) southwestward it declines in elevation.

New River, flowing northwestward, enters the plateau in a canon 1,500 feet deep. All the other streams crossing the Front rise in the plateau and flow southwestward, to emerge from deep canons into the minor valleys of the Great Valley. This peculiar drainage adjustment was brought about by a southwestward tilting of the northern part of the plateau, in the elevation subsequent to the Schooley Peneplain stage, while south of the New River divide the tilting was to the southwest.[7]

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[6] American Journal of Science, 1887, p. 262.
[7] I. C. Russell, Rivers of North America, p. 205.

CLIMATE.

The climate of any region is determined by averaging the weather conditions prevailing during the different seasons. Temperatures, pressures, humidity, absorption, radiation, winds and currents are the important causative factors. Some may prevail with persistent constancy, while others fluctuate between wide extremes. The former may be designated in the catalog of climatic control, as constants; and the latter, as variables.

The potential wealth of any region is determined almost entirely by the climatic and soil conditions, and of these the climatic factor is of greater importance, since no soil is productive under adverse climatic conditions; and all soils, excepting strong alkali, are at least fairly productive under favorable climatic conditions. Virginia holds an exceptionally favored position in the general harmony of these two wealth determinant elements, so that nothing is lacking from the standpoint of natural essentials, for the largest and most economic development of the state's resources.

The climate of Virginia is variable in all parts of the state to the extent of having distinct seasonal changes, while it is not extreme in any part to the extent of being destructive to any of the crops or industries adapted to each region. Great and sudden changes are not only destructive to agricultural and manufacturing interests but enervating to the people,—of whatever race,—upon whom the economic development depends. The fact that the climate of Virginia is conducive to the most efficient voluntary activity is therefore not to be underestimated.

The climatic belts of the state are in general coincident with the physical divisions. There are limited areas, which, by virtue of their position, are subject to more sudden changes and greater extremes.

There are no high mountain ranges in the state, but the elevation is continuous from the seaboard to the Blue Ridge. We find in Table I (p. 26) a difference of 10° in the mean annual temperature of Norfolk and Burke's Garden, the latter being an observation station in Tazewell County. This difference would be even greater but for the tempering effect of the warm waters of the Gulf of Mexico on the prevailing southwestern winds. The rainfall varies somewhat with the season, but the general average for different years shows that no geographic division can be said to be favored above another. This average ranges between thirty-five and forty-five inches. The rainfall of the Tidewater region would be considerably heavier than in the Blue Ridge, the Valley, and the Appalachia regions, but for the re-saturation of the southwestern winds as they pass over the warm Gulf waters. Killing droughts and disastrous weather changes, such as are common to the region west of the Mississippi River, are unknown. In Texas we find a maximum difference in the mean temperature of 21.7°, and droughts are not infrequent in the northern and western portions of the state. Washington shows the widest range in the annual rainfall, Clearwater having an average of 126 inches, and Mottinger Ranch an average of 11 inches.

The Alleghany Highlands, extending for a distance of 200 to 500 miles west of the state boundary, constitute an effectual barrier against the storms which originate in the Mississippi Valley region.

The mean average annual temperature for the whole state is about 56°.

Tidewater.

The climate of this coastal region has a mean annual temperature of 58° to 61°, being greatly ameliorated by the warm northwest currents of the Atlantic, whose waters intermingle off the Florida coast with the heated waters of the Gulf Stream as they emerge from the Gulf of Mexico, and flow thereafter as a northeast current along the eastern coast of the United States. The soil of this belt is universally sandy or a sandy loam, and, with a limited rainfall, or cold climate, would be of little economic value. Having an adequate rainfall and a warm-temperate climate, it becomes ideally adapted to the profitable industry of trucking, and holds first rank in this line of production. Much of the arid land of the west has a similar soil, and as favorable temperature requirements, but is practically worthless for lack of rain supply or irrigating facilities.

The average growing season[1] is from seven to seven and one-half months' duration. The winters are short and mild; the snowfall light; and the freezing never extreme or protracted. The summer's heat is so tempered by the sea-breezes as to seldom become oppressive.

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[1] Average duration from the last killing frost in the spring to the first killing frost of autumn.

Malaria was common during the early Colonial days, but this has been largely exterminated by clearing the forests, draining the lowlands and swamps, and the removal of the residences to more sanitary locations.

The mean annual temperature of the extreme southern Tidewater Counties averages about 60°. It is in this belt that cotton is grown to a limited extent. The mean annual temperature decreases gradually within narrow limits as we pass northward. This results both from the more inland geographic position, and the difference in latitude. The heaviest rainfall registered in Tidewater is in the Richmond, Williamsburg, Pamunkey and Gloucester Peninsulas, this belt being northwest of the Chesapeake Bay mouth. Even in the Virginia coast region there is considerable seasonal variation in the amount of precipitation.

Piedmont.

The average mean annual temperature of this belt is 56°-58°. Lynchburg is near the boundary line of eastern and western Piedmont, and Manassas is on the line. In 1900, the average for Lynchburg was 58.4°, and for Manassas 56.5° (in 1902 the average for Lynchburg was 56.8°, and for Manassas 54.1°). This climatic belt marks the area of the most successful tobacco culture. Tobacco is also cultured with fair success in the mountain areas, with a mean annual temperature as low as fifty-two degrees.

The growing season of the Piedmont belt is two to three weeks shorter than in Tidewater.

There is greater variation in the prevailing direction of winds in this belt than exists in any other part of the state, because of its inland location with reference to both the mountains and the sea. The autumn winds are prevailingly northwest, but those of the other seasons fluctuate, the east and northeast being most common in the spring and summer. The northwest autumn winds are usually displaced by western winds in the early winter, which in turn give way to southwest winds before March.

Blue Ridge, Valley and Appalachia.

These regions constitute the mountain district of the state, in which the climatic differences, so far as revealed by observations, do not justify a differentiation. The mean annual temperature of the Blue Ridge and the Valley is 52°-56°, and that of Appalachia is 48°-54°. We may correctly designate this as the zone of grasses, grains, and apples. The average mean annual temperature not only increases as we pass from east to west, but also from north to south, since the elevation gradually increases from the Potomac River southward.

The aggregate precipitation of the mountain district does not differ materially from the Piedmont belt, but the proportion represented by snow is much greater; and the rains are more frequent and of shorter duration. The rainfall also increases with the altitude up to a variable limit, which is fixed by the local conditions. The mountains not only cause the condensation of the vapor brought by the rain-bearing winds, but prevent this supply of moisture from being carried away again by the winds in dry, clear weather. The rainfall of the Valley is greatest along the base of the mountains, since the air, approaching the mountains, is forced to rise some distance from the barrier. Most of the rain is supplied by the southeast and southwest winds, the one directly off the warm Atlantic, and the other less directly off the warmer Gulf. Those from the Gulf have been robbed of some of their moisture by the intervening land areas, but the increased elevation enables them to draw more effectively from the decreased supply. Equalization of distribution is established by the eastern half of the state having the advantage of ocean proximity, and the western half the greater elevation.

The duration of the growing season is five and one-half to six months in the Blue Ridge and Valley, and an average of two weeks less in the Appalachia belt.

This region, together with that part of Piedmont adjacent to the Blue Ridge, is peculiarly adapted to apple culture. The most successful growers plant their orchards on the mountains, because the valleys are not only more subject to frost, but the winter temperature is lower than for the mountain, up to a greater elevation than is represented by the mountains of Virginia. It is for this same reason that the coffee plantations of Brazil are laid out on the high ground. This theory when first advocated was considered absurd. It is no longer accepted as a theory but as a fact, having been demonstrated by the scientists of America and Europe. The explanatory cause is, the greater radiation in the valley. This is not necessarily more rapid, but of longer duration. It begins one to two hours earlier in the evening, and continues one to two hours later in the morning. The following we quote from Julius Hann:[8]

"The Swiss have learned by experience that the mountain sides have far more favorable temperature conditions in late autumn and in winter than the lowlands. During one of the calm, clear spells of late autumn the traveler who spends a few days at one of these farm houses on the steep mountain side may there breathe air which has the mildness of summer; he may see the green fields still decked with autumn flowers . . . while down below, in the valley, the ground is already frozen hard by the frost, the trees are lifeless, and all the activities of plant life have long ceased."

There is a wide variation in the snowfall of the state, both regionally and seasonally. It is usually light and of short duration in Tidewater and Middle Virginia. From the Blue Ridge westward, however, it is not uncommon for the ground to be blanketed during a period of six weeks or two months. This is of great economic value to the grain and grass crops, both protecting them against the intense cold of January and February, and ameliorating the effect of the thaws of occasional warm days. Since the region under discussion includes most of the large forested areas of the state it is important that we make a brief study of the climatic effects of forests. Forests increase the absorption, and protect the contained moisture from speedy evaporation. This is most in evidence during a drought. When the fields are parched and dusty, scarcely showing signs of life, the adjacent forest has a wealth of foliage and flower. Throughout the areas that have been deforested during the last half century there is a noticeable decrease in the size of the streams. The ruins of old mills still remain on streams whose volume would now be entirely inadequate. The influence of forests on the distribution of water supply is greatest in connection with the snows and rains of the winter season. By preventing the snows from drifting and decreasing the melting, a forest area thereby holds the water until it can be assimilated by percolation and absorption. We do not insist that the aggregate rainfall has been materially lessened, but that the same rainfall in a deforested region cannot be so thoroughly assimilated. If the country is deforested the ground usually freezes

[8] Handbook of Climatology (Ward's translation), p. 264.

several inches before it receives much snowfall, and, in consequence, remains frozen to a greater or less extent until the approach of spring. The frozen earth being almost impervious, causes the loss of most of the water by surface drainage. The natural result is that floods are more frequent and more disastrous in deforested regions.

Forest soils have also that constituency and protection which appreciably decreases radiation, The old settlers recognize them as "warm soils," without having the knowledge of a scientific explanation. The inability to raise peaches in certain parts of Michigan with former success has been ascribed by some students of the question to the deforestation of the country.

General Remarks.—The climate of Virginia is ideally adapted to successful agriculture, since the prevailing conditions in the different geographic divisions are such as are best suited to the soils of those regions. If the Blue Ridge and Tidewater could exchange positions, Virginia would cease to supply the eastern markets with early vegetables, and, instead of an annual surplus of more than $10,000,000, would be but little more than self-supporting. Then, if Appalachia could exchange places with Piedmont, Virginia would cease to be an important tobacco-producing state, and the net receipts from this resource alone would be decreased by at least $5,000,000 per year. The rainfall has the most advantageous monthly distribution with reference to farming operations and the growth of crops, being somewhat heavier from April to July, which makes disastrous droughts unknown. The growing season of each section is always long enough to mature the standard crops of that section.

In general healthfulness, few if any states are more favored. The coastal region is growing in importance as a winter resort, and the western part of the state has for many years been a Mecca for summer tourists who seek health and comfort. Popular resorts are to be found in almost every county west of the Blue Ridge.

MEAN ANNUAL TEMPERATURE, RAINFALL AND SNOWFALL, AND LENGTH OF GROWING SEASON.

TABLE I, 1900-1905.

FOR REPRESENTATIVE VIRGINIA STATIONS.

							ANNUAL		KILLING FROST		ANNUAL	
							EXTREME					
STATION.	NAT. DIV.*	JAN.	APR.	JUL.	OCT.	MEAN	MAX.	MIN.	LAST IN SPRING.	FIRST IN AUTUMN.	RAINFL. INCHES.	SNOWFL. INCHES.
TABLE I, 1900:												
Norfolk	T	42.	45.5	80.9	65.8	60.7	100	13	Mch. 22	Nov. 10	39.34	7.3
Richmond	P-T	39.4	57.3	81.2	64.6	59.7	102	10	Apr. 5	Nov. 10	37.76	15.1
Farmville	P		57.6	80.6	64.4		105		Apr. 14	Nov. 6		9.
Lynchburg	P	37.6	57.1	78.6	63.3	58.4	100	9	Mch 22	Nov. 10	47.10	7.2
Staunton	V	37.4	54.3	77.1	61.	56.9	102	2	May 10	Nov. 9	39.02	
Clifton Forge	A	31.8	50.5	74.6	63.	55.1	100	6	Apr. 15	Nov. 6	37.91	
Blacksburg	V	35.7	51.2	71.4	57.3	52.9	96	-2	May 10	Oct. 18	43.75	20.5
Manassas	P	35.0	53.6	78.8	60.7	56.5	99	2	Apr. 15	Nov. 9	31.07	4.5
Burkes Garden	A	31.3	48.9	67.9	54.0	50.1	89	-6	May 5	Oct. 10	41.85	38.0
Bigstone	A	35.2	55.2	75.2	63.4	56.3	95	-4	May 11	Nov. 5	48.9	20.5
TABLE II. 1901.												
Norfolk	T	41.2	52.0	81.0	61.0	58.5	100	16	Mch. 8	Nov. 11	42.61	11.5
Richmond	P-T	38.8	52.8	81.0	59.1	59.2	99	9	Mch. 17	Nov. 6	42.05	15.8
Farmville	P	39.0	53.6	82.2	57.4				Mch. 30	Oct. 26		1.00
Lynchburg	P	38.3	51.9	80.0	57.0	55.7	97	8	Mch. 18	Oct. 26	54.81	10.3
Staunton	V	37.6	50.0	78.2	56.8	54.1	96	1	Apr. 12	Oct. 30	51.18	
Charlotteville	P	37.8	51.8	79.0	59.4	55.4	97	7	Mch. 12	Oct. 12	65.29	15.5
Blacksburg	V	33.0	45.2	74.0	52.0	50.0	92	0	Apr. 12	Oct. 4	53.46	20.3
Wytheville	V	35.1	47.0	75.4	54.7	52.2	95	0	Apr. 12	Oct. 8	62.65	
Burkes Garden	A	31.8	42.4	70.4	48.4	47.6	88	-14	Apr. 29	Sept. 21	63.71	
Bigstone Gap	A	35.4	49.0	76.5	54.9	53.3	95	-5	Apr. 24	Oct. 4	55.77	28.8
TABLE III, 1902:												
Norfolk	T	37.4	56.0	79.6	64.2	59.3	98	18	Mch. 19	Dec. 6	38.4	0.1
Richmond	P-T	36.2	55.8	79.0	61.6	58.2	98	15	Mch. 7	Oct. 30	49.32	2.2
Farmville	P	33.6	54.8	80.7	59.6		101	4	Mch. 21	Oct. 22		
Lynchburg	P	34.2	54.8	78.5	59.0	56.8	99	13		Oct. 30	48.79	2.1
Staunton	V	33.8	52.4	76.3	58.4	54.9	99	9	Apr. 16	Oct. 15	38.19	
Clifton Forge	A	28.0	47.7						Apr. 20			
Blacksburg	V	30.5	49.0	72.5	55.1	52.4	95	5	Apr. 18	Sept. 14	33.73	6.
Manassas	P	33.5	50.0	77.0	58.6	54.1	103	0	Apr. 20	Oct. 22	36.85	
Burkes Garden	A	29.0	44.7	67.6	50.7	48.5	87	0	Apr. 18	Sept. 14	43.95	11.0
Bigstone Gap	A	33.4	52.2	74.2	57.6	55.1	94	6	Apr. 13	Oct. 15	48.06	
TABLE IV, 1903:												
Norfolk	T	41.2	58.0	78.7	60.6	59.0	97	14	Apr. 5	Oct. 28	46.10	15.2
Richmond	P-T	38.2	57.8	79.3	58.9		93	7	Apr. 24		47.42	20.4
Farmville	P	38.2	55.4	78.9	57.8		99	12	May 3	Oct. 26		
Lynchburg	P	36.6	56.1	77.6	58.0	56.4	96	8	Apr. 5	Oct. 27	41.24	14.6
Staunton	V	34.6	54.5	74.2	57.1	54.4	95	-5	May 2	Oct. 25	45.63	
Rocky Mount	P	33.4	52.6	71.2	53.2		89	7	Apr. 6	Oct. 27	47.61	
Blacksburg	V	32.5	50.5	71.8	53.2	51.2	91	-7	May 2	Sept. 29	44.76	20.0
Burkes Barden	A	29.7	47.2	66.8	48.8	48.1	86	-6	May 5	Sept. 19	46.22	28.0
Manassas	P	33.0	53.1	75.8	56.6		96	2	Apr. 6	Oct. 27		
Williamsburg	T	35.8	56.2	78.0	57.8	56.9	98	9	Mch. 4	Oct. 27	49.24	
Bigstone Gap	A	39.0	54.3	74.0	55.2	55.1	94	-3	Apr. 24	Oct. 19	46.8	20.9
TABLE V, 1904:												
Norfolk	T	36.4	55.4	77.2	59.6	57.4	94	12	Mch. 29	Nov. 7	42.6	12.2
Richmond	P-T	33.4	54.2	77.7	57.7	56.2	98	9	Apr. 20	Oct. 28	37.84	19.0
Farmville	P		52.8	78.0			98		Apr. 21			
Lynchburg	P	32.8	52.2	75.6	56.2	54.8	98	3	Apr. 22	Oct. 4	26.87	19.2
Staunton	V	30.3	50.0	72.5	55.7	52.9	95	-4	Apr. 22	Oct. 7	28.84	
Wythville	V	28.8	46.5	69.4	51.8	50.7	89	1	Apr. 22	Oct. 15	24.36	19.9
Blacksburg	V	29.	46.6	69.4	52.4	50.3	91	-3	May 16	Oct. 15	32.25	26.0
Charlottesville	P	31.8	52.8	75.1	58.6	55.3	90	4	Apr. 22	Oct. 7	30.37	21.0
Burkes Garden	A	26.2	44.1	64.1			85	-14	May 11	Sept. 16	39.59	29.0
Bigstone Gap	A	32.5	51.1	71.8	55.3	54.3	92	5	May 17	Oct. 24	39.06	30.2

POPULATION.[1]

The total population of Virginia in 1900 was estimated at 1,854,184. According to the normal rate of increase the present population is about 2,000,000. Of the total population 63.4 per cent were native whites, 35.6[2] negroes and of negro descent, and 1 per cent foreigners. During the last decade the native whites increased 12 per cent, the foreign born 5.9 per cent and the negroes 4 per cent.[3]

Only 16.5 per cent of the total population is urban, as compared with 81.8 per cent in Massachusetts, 30.9 per cent in Pennsylvania and 28.2 per cent in Ohio. The urban population of the state increased 22.7 per cent 1890-1900.

The population statistics of the different natural divisions give a fair index of the economic development and prosperity. The decade increase in Tidewater, exclusive of incorporated towns, was 14.1 per cent, which evidences a normal healthful development in agriculture, this being the only rural source of wealth. In the Piedmont division the population curve rapidly descends to an average increase of 4.3 per cent, which reveals a condition of retardation, or of very unsatisfactory development in much of this area. In six counties within sixty miles of Richmond there was an absolute decrease in the population. There are only three counties situated wholly in the Blue Ridge division: Floyd, Carroll and Grayson. These are rugged plateau counties, which until recently were twenty to thirty miles from railroad connection. The products of the farm and forest are naturally their only source of wealth, but they are a contented, hard-working people, devoted to their secluded environment. The population increased in this territory 16.1 per cent during the past decade, and may be taken as the normal birth rate increase. The Valley population increased 13.5 per cent, showing a steady progressive development. This is the most productive agricultural region of the state. It has for many years been served by a railroad line throughout its length. The pro-

[1] Based on statistics of Twelfth U. S. Census, 1900.
[2] In 1890, negroes constituted 38.4 per cent of total population in the state.
[3] Negro increase in United States for same period was 18.1 per cent.

ductivity of the soil, proximity to shipping points and small towns, and a native population trained to labor with the hands, have minimized the tendency for urban migration. Appalachia has been the scene of the most phenomenal increase in population, chiefly through the growth of the coal and iron industries. The average increase in population (1890-1900) was 29.9 per cent, and the rate of increase since 1900 has probably been greater. Wise County showed an increase of 110.3 per cent; Alleghany, 75.9 per cent; Buchanan, 65.2 per cent; and Dickinson, 52.6 per cent.

The negro population of Virginia is undergoing a rapid readjustment in aggregate and territorial distribution, He is decreasing relatively, since in 1890 there were 62,290 negroes to each 100,000 whites, while in 1900 there were 55,000 negroes to each 100,000 whites. The migration of the negro is taking place in four directions: from the state as a whole to northern and eastern cities; from the non-mining districts to the mining districts; from the country to the cities and towns of the state; and from the mountains to the valleys. The population was never large in the mountain sections, but almost all of the few thousands who lived in the mountains have moved out. More than 30 per cent of the total colored population live in cities and towns, while less than 20 per cent of the white population is urban. The relative decrease in the population is attributable to the high death rate, and the northern migration, chiefly to Washington, Baltimore, Philadelphia and New York.

As a factor in the labor situation, the negro is important; but it is difficult to predict his economic future. In Virginia he is drifting rapidly away from agriculture, is generally unsatisfactory in factory service, and many are developing such a marked aversion to domestic service as to be willing to live in poverty rather than engage in it. In whatever service engaged he is irregular, but, notwithstanding this serious objection, is generally considered as the most satisfactory laborer in construction work and mining operations. The same may be said of his services in restaurants and hotels.

Of the total population engaged in some gainful occupation (536,883), 45.4 per cent are engaged in agriculture, as compared with 51.5 per cent in 1880; 15 per cent in domestic and personal service; 14.1 per cent in manufactures and mechanical pursuits;

11.2 per cent in trade and transportation (as compared with 6.4 per cent in 1880); 2.5 per cent in professional service; 1.4 per cent in fishing; 1.1 per cent in mining and quarrying; and the remaining 9.4 per cent in sundry vocations.

The rapid development of the coal and iron mines and the extensive railroad construction are creating a great demand for foreign labor, as a result of which foreigners are coming in more rapidly than in former years. So urgent also are the demands for farm laborers that special inducements are being offered for attracting classes of foreigners suited to farming and trucking.

REGIONAL STUDY OF PRODUCTS AND RESOURCES.

AGRICULTURE.

Virginia is characteristically an agricultural state, and until within recent years this was the only industrial pursuit which afforded a surplus. The abundant supply of raw materials, mineral wealth, superior water-power, accessible transportation routes, and superior harbors have already begun to stimulate manufacturing enterprises, which are destined to make the Virginia of the future an important agricultural and manufacturing state. The factory growth will increase proportionately the demand for farm products, and thereby bring about a more intensive and economic system of cultivation.

There is no other state east of the Mississippi River adapted to so great a variety of products. It possesses representative soils from all of the geographical formations, and well defined climatic zones from 60° mean annual temperature in southern Tidewater to 48° mean annual temperature in the southern Appalachia region. Almost all of the staple American crops find salutary conditions in some part of the state, and no part of the state has been brought into a high state of cultivation. A transition is, however, in progress. The exhaustive plantation system of consecutive cropping is passing out in all parts, and in its stead scientific methods of cropping and culture are being installed. The average size of the farms has decreased from 339.6 acres in 1850, to 118.6 acres in 1900, and still only one-half of the farming land is in cultivation.

Brief attention will be given to the important agricultural products of the different geographic divisions of the state.

Tidewater.

Cotton. This is not an important commercial crop, but deserves mention since southern Virginia marks the northern limit of cotton culture. The 37th parallel marks in general the northern limit of the cotton belt, but in Virginia it detours south of this latitude about 100 miles east of the coast. Virginia was the first state to grow cotton (1784).

The cotton acreage is being steadily decreased[1] by the more profitable cultivation of garden products, peanuts, tobacco and small fruits. Brunswick, Greenesville, Mecklenburg and Southampton are practically the only counties in the state cultivating cotton.

Peanuts. This is the most important crop in that part of Tidewater south of the James River. The soil and climate conditions are so favorable in this belt as to give an annual yield of three and one-half to four million bushels in eight counties, and the production outside of these counties is commercially insignificant. Peanuts require a dark sandy loam, and a growing season of not less than five months. Where lime is deficient it must be supplied.

The uses of peanuts are being rapidly extended. Millions of bushels are consumed in Europe in the manufacture of peanut oil, which, it is claimed, cannot be distinguished from olive oil. Peanut meal, the secondary product from the oil manufacture, sells at $30 to $33 per ton for cattle and sheep feed.

Fruit. Norfolk and Princess Anne Counties are the only Tidewater counties south of the James River not important peanut producers. These two counties produce about one-half of the total strawberry[2] crop. All of eastern and southern Tidewater is admirably adapted to small fruits. Blackberries and raspberries mature well and early, but are not so profitable as strawberries. The region it too low and the climate too humid for profitable apple culture.

Garden Products. Trucking is the great industry of Tidewater Virginia. The soil adaptation and the climatic conditions for the staple vegetables are not surpassed by any other region in the United States. That the industry is rapidly increasing is evidenced by the fact that in the decade 1880-1890 the total production increased more than 500 per cent.

Most of the vegetables are marketed in the eastern cities, where they command the high prices of the early market. The canning industry has not been emphasized, but is receiving more attention. This branch has a wide possible zone, and will develop throughout the state.

Cereals. Most of the cereals are cultivated in Tidewater, but none of them extensively, since the better adapted crops are more profitable. For the same reason the raising of live-stock is not an important industry, excepting hogs,[3] which find a favorable ration in peas, peanuts, sweet potatoes, sugar cane and corn.

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[1] Total acreage in 1899, 25,724 acres, giving a total production of 10,789 commercial bales.

[2] 1899, Norfolk and Princess Anne produced 6,824,000 quarts.

Piedmont.

The soil of Piedmont varies from a slight sandy or micaceous loam on the east, to heavy red or yellow clays on the west, with interspersions of clay loams or sandy loams, depending upon the rock formation of the region. The valleys have an alluvial soil the fertility of which is somewhat varied.

Tobacco. This is the most important crop of southern Piedmont.[4] Pittsylvania, Halifax and Mecklenberg Counties afford more than one-third of the state's total tobacco production, and thirteen Piedmont counties situated south of the James River produce above 3,000,000 pounds annually. Virginia produces from 120 to 150 million pounds per year,[5] valued at from seven to ten million dollars. Among the states, Virginia ranks third in total production, North Carolina being second, and Kentucky first.

Light sandy soils[6] produce a superior grade of the bright yellow tobacco, while heavy loams and clays produce dark heavy grades. Southern Piedmont is especially adapted to the production of the yellow grades, while the dark grades are produced in northern Piedmont, the Blue Ridge, and the Valley.

Corn. The northern and southern counties are large producers of corn. Of the five counties leading in corn production two are situated in the northern part of the division (Loudoun, first; and Fauquier, second), and two in the southern (Pittsylvania, fourth; and Halifax, fifth). The profitable culture of corn in the middle portion of Piedmont is largely limited to the alluvial valleys. The exhausted condition of much of the land of this region is attributable to consecutive cropping in corn and tobacco. In no other section of the state is the demand so urgent for a varied crop rotation. A system of larger returns to the land is its only agricultural hope. Exhaustive crops must be avoided as much as possible, leguminous crops generally introduced, fertilizers judiciously applied, and the harvested crop fed back on the land.

Hay. The harvesting of grasses is general throughout the

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[3] An average of 7,500 head of hogs to each county of Tidewater.

[4] Tobacco held first place in the scale of agricultural values in Virginia until 1783.

[5] 1899 crop, 122,885,000 pounds.

[6] Sand 10 to 12 inches in thickness, with no more than 8 to 10 per cent of clay. Bulletin No. 83, U. S. Department of Agriculture.

Piedmont, but the supply does not meet the demand. Only the northern counties produce a surplus. The soil of these counties being fertile is adapted to timothy and clover. In central and southern Piedmont cultivation is concentrated on the most fertile lands,—bottom land and land recently cleared,—so that most of the grasses produced are grown on the uplands. It is in this same region that much of the upland has been impoverished by inferior and continuous cultivation. By a careful preparation of the soil and the judicious selection and use of fertilizers the legume crops, alfalfa, crimson and alsike clover, cow-peas and soy beans, can be grown, so as to give a direct profit, and at the same time improve the land. Where the experiment has been tried the results have been highly satisfactory. Orchard grass is well adapted to the impoverished clay lands of western Piedmont, either as a pasture or harvest crop. Carpet grass is best adapted to the most sandy soils of southern Piedmont.

Live-Stock. Cattle raising is the most important branch of this industry, and is much more important in western Piedmont than in the eastern, or that part commonly known as Middle Virginia. In 1899 there was an average of 25.2 cattle per square mile in western Piedmont, and only 8.8 per square mile in eastern Piedmont. The difference was as marked in the sheep industry, there being 15.4 sheep per square mile in western Piedmont, and 4.8 per square mile in eastern Piedmont. The northern counties, Loudoun, Fauquier, Rappahannock, and Culpeper, are among the largest producers of cattle in the state.[7]

The raising of sheep and goats is especially adapted to the more rugged parts of Piedmont, and should receive more attention. Many sheep are raised, but the goat industry has scarcely been introduced experimentally. Goats thrive on forest ranges, thousands of acres of which would give a good cash return if stocked with Angoras.

Fruits. The soil adaptation to fruit culture has never been worked out in detail for Piedmont. There are four types of soil characteristic of the region: the sandy clays and light alluvial soil of the crystalline area; the red clays of the sandstone regions; the light sandy soil of southern Piedmont; and the alluvial soils of the valleys. The lighter soils are adapted to the small fruits, grapes and stone fruits. There is no part of western Piedmont which will not grow some variety of apple with at least fair success. Albemarle County is the home of the famous export variety, known as the Albemarle Pippin. The red varieties mature best in southern Piedmont. Peaches are grown extensively in Patrick, Henry, Franklin and Bedford Counties.

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[7] Loudoun, first: and Fauquier, second.

Blue Ridge.

This division is limited to the Blue Ridge range, which is not important agriculturally except in the southwestern part of the state, where the narrow ridge spreads out into a fan-like plateau. It consists of rocky, sterile uncultivated ridges; less sterile uplands; and fertile intervening valleys. The plateau portion includes the whole of Carroll, Grayson, and Floyd Counties, and a small portion of Franklin and Montgomery Counties.

Live-Stock. The large areas of unimproved lands, the ruggedness of the upland, and the remoteness from transportation facilities, make this division peculiarly adapted to stock-raising. We accordingly find more cattle and sheep per square mile in the plateau counties of Blue Ridge than in any other division of the state. The last census gave 33 cattle, and 46.3 sheep per square mile. Most of the cattle are under two years of age, and the breeding of both cattle and sheep is emphasized. This is shown by the Blue Ridge region having 14.5 cows per square mile, and the Valley only 7.7 cows per square mile. The improvement of the breeds represents the greatest opportunities to the farmers for increasing their profits.

Cereals. The area being, by necessity of situation, largely a self-sustaining unit, the cereal production is gaged to meet the local consumption. Since corn is the most generally used stock food it is the most important cereal crop. Its cultivation is concentrated in the narrow fertile valleys. The wheat acreage of the whole Blue Ridge territory is less than that of some of the most fertile of the Valley counties, while the total production of buckwheat in Carroll, Floyd and Grayson Counties exceeds the total production in all the other divisions. The economic explanation of this condition is that the yield of buckwheat has been found to be much greater than that of wheat, and it supplies a breadstuff which is both an economic and popular substitute for wheat. Rye, oats and millet are cultivated to a limited extent.

Fruit. The Blue Ridge is the largest producer of apples proportionate to the acreage, and proportionate to the number of trees. The soil and climate make it best adapted to the red varieties, of which the Winesap holds first place. This industry is destined to become one of the largest sources of wealth, with the improvement of the highways, construction of railroads, and improvement in the methods of caring for the orchards and marketing the product.

The Valley.

The Valley stands out prominently not only as the most fertile of the natural divisions, and therefore the most productive, but is almost equally adapted to all the branches of temperate zone agriculture. It consists of major and minor valleys, rolling uplands, and outlying ridges. Since the prevailing soil is limestone most of the upland regions are fertile, and adapted both to cultivation and grazing.

In addition to its varied crop adaptation it has a geographic situation and topographic configuration which marks it out as a natural transportation route, in consequence of which, it is traversed throughout its length by a railroad easily accessible to all parts of the region.

Cereals. Virginia as a whole consumes more cereals than produced; but the Valley produces a surplüs of wheat and corn, the wheat surplus being the larger. Of the total wheat production of 8,900,000 bushels more than one-half is grown in the Valley. The adequate and well distributed water-power is utilized in manufacturing the product into flour. While the cultivation of wheat is steadily decreasing in Tidewater and eastern Piedmont, it is steadily increasing in the Valley and Appalachia. Augusta County holds first rank, with a total production of 823,580[*] bushels.

As a result of the special attention given to the live-stock industry throughout the Valley, the cultivation of corn is general. It is naturally somewhat concentrated on the alluvial bottom lands, but not to the extent practised in the other divisions.

Since farming has been more profitable in the Valley than in other portions of the state, the methods of cultivation are proportionately more advanced. There is, however, much room for improvement, in the more judicious selection and rotation of crops.

[*] 1899.

Since corn is an exhaustive crop even on strong soils, it is important that the proportionate consumption for stock feeding be much reduced. This can be done without a reduction of net profits by a more extensive use of ensilage, cotton seed meal, rye, barley, buckwheat and roots.

The question of seed selection has not been given the attention it deserves in any part of Virginia. The seed should be thoroughly dried and stored in a dry room. Artificial drying of corn materially increases the percentage of germination. Experiments on a Potomac River farm gave 85.5 bushels per acre from fire-dried seed, and 67.3 bushels from the air-dried seed. A seed patch should be cultivated, separate from the regular crop, on the best land and from the best seed at the farmer's command. The tassels from all barren stalks in the seed patch should be removed before they are ready to discharge the pollen. An experiment by the United States Department of Agriculture[9] showed on a count, of 25,000 stalks 3.43 per cent of barren stalks in the seed patch from which the tassels had been removed; while on a similar area from which the same kind of seed was used, there were 8.11 per cent of barren stalks.

The cultivation of oats and rye is decreasing in the state, for the reason that other cereals and grass crops are more profitable.

Hay. The Valley produces the largest surplus of hay, the total production having doubled since 1880. The rapid development of the Virginia-West Virginia coal fields so increased the demand for forage in the adjacent territory, that the Valley region was able to command a local price considerably above the market price.

Live-Stock. The Valley and the adjacent portion of southern Appalachia is the natural live-stock belt of the state. The prevailing soil is a strong limestone residual on which blue grass is indigenous. The proportionate area grazed is not so large as formerly, but through more general and better cultivation the acreage capacity has been increased, and more returned to the soil by the feeding or forage crops.

Most of the export cattle of the state come from the Valley, southern Appalachia, and northern Piedmont. The sheep industry has developed very rapidly. In 1874 there were 11.4 sheep per square mile in the Valley, while in 1900 there were 27.3 sheep per square mile, an increase of 140 per cent. Three factors have fostered this development: first, the large increase of the upland grazing areas by clearing; second, the division of large estates into small farms, which are better adapted to a profitable sheep industry than to cattle; and third, the high market price of sheep and their products.

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[9] U. S. Department of Agriculture, Year-book, 1902, p. 549.

No attention has been given to horses as a classified industry, since the statistics do not separate those used for domestic purposes and those raised for the market. The industry is growing, and great improvements are being wrought in the breeds. Importation of Kentucky drivers and saddlers has been in vogue for many years, when the Valley of Virginia was ideally adapted to the development of the noblest strains. The indications are that soon the Valley and northern Virginia will become well-known producers of high-grade and high-priced mounts.

Fruits. The Valley is a large producer of apples. The Winesap thrives best and is most extensively planted. The industry is growing in favor, and will become a very important source of wealth.

Appalachia.

About one-fourth of this division is adapted to profitable agriculture. The most productive counties in their order are, Tazewell, Russell, Giles, Bland and Craig. Coal, lumber and iron ores represent the largest resources in the other Appalachia counties.

Live-Stock. This is the most important agricultural industry, and in its development Appalachia compares favorably with the Valley and the Blue Ridge. In 1874, the average number of cattle per square mile was 13.7, and in 1900, 23.4. Because of the broken and rugged topographic conditions which prevail, the region is especially adapted to the grazing of small cattle, and these prevail, except in Tazewell and Russell Counties. The woodland ranges are large, and the losses by death, straying and stealing make the net profits proportionately less.

The sheep industry has developed paramount to the cattle, having increased from 11.0 per square mile in 1874, to 30.3 in 1900. With the continued development of the country the industry is sure to increase in importance.

Angora goats are being introduced in certain districts with satisfactory results. They are hardy feeders and not subject to the ravages of dogs, and thereby especially adapted to woodland ranges.

Cereals and Hay. Being a live-stock region these are cultivated to help meet the home demand. There is no surplus, and the mining portion of the region stands out as the largest importer of cereals and forage crops of any part of the state. The counties of largest mineral resources are, as a rule, the poorest agricultural counties west of the Blue Ridge.

General Remarks. One-fourth of all the farms in the state derive their largest income from live-stock; 22.3 per cent derive their largest income from hay and grain; and 11.6 per cent from tobacco.

MINERAL RESOURCES AND BUILDING STONES.

The mineral resources of Virginia have neither been thoroughly studied nor extensively developed. Little was done toward their development prior to 1880. Since all of the major geological divisions are represented in the state we could naturally expect a great variety. Judging from our present knowledge of the minerals and their distribution, coal and iron are the most abundant, and Appalachia and the Valley represent the richest mineral zones.

Building stones and the residuary products, sands and clays, have a widespread occurrence throughout the state. These have received even less attention than the minerals proper.

Coal. The coal fields are being developed rapidly, and the total value of the product is greater than the total of all other mineral products. There are three distinct fields, each belonging to a distinct geological horizon, and each separated from the other by a series of older formation than the oldest coal-bearing strata known. The smallest area is generally known as the Richmond Basin, which includes a small portion of Chesterfield, Powhatan, Goochland and Henrico Counties. The Richmond coal occurs in rocks of the Jura-Trias period. This field, though but 150 square miles in area, was the chief source of the domestic supply in this country up to 1842. It is estimated that more than 1,000,000 tons were mined from 1822 to 1842. It has been longer worked than any other coal field in America. The supply is practically exhausted, the output in 1903 being only 15,000 tons.

The second field I shall designate as the Brush Mountain field, since most of the workable coal thus far developed occurs in this range, and its outlying ridges. The outcrops have been identified in Botetourt, Roanoke, Montgomery and Pulaski Counties, but are only mined in Montgomery and Pulaski Counties to an extent to be reported in the coal statistics of the state. The coal is a semi-anthracite variety of the Lower Carboniferous (the Sub-carboniferous of the Rogers classification). The beds vary from a few inches to six feet in thickness, and are interstratified with shales and sandstones.

The third field, the largest in area and production, may be appropriately called the Alleghany coal field, and is but a continuation of the great Pennsylvania-West Virginia field. It is the bituminous variety, and is an excellent steam, gas and coke coal. The development has been rapid since the construction of the New River branch of the Norfolk and Western Railroad in 1882. Almost all of the lands underlaid by coal have been purchased by large companies, and are being operated according to the latest and most approved methods of scientific mining, in the counties of Tazewell, Russell, Scott, Lee, Wise and Buchanan. Wise County is the largest producer, Tazewell is the second, and Russell third.

In 1904 the total output for the state was 3,500,000 tons, valued at about $3,500,000. In 1905 the total output was 4,275,000 tons (net), and the coke output for the same year was 1,500,000 tons. The total production in 1882 was 112,000 tons, which shows a rapidity of development which is scarcely equaled by any other field.

Iron. Deposits of iron ores occur in all of the geological formations from the oldest crystalline rocks of Middle Virginia, to the Pliocene sands and clays of Tidewater. Being in most cases a secondary product the result of concentration, through crystallization, solution or transportation, the deposits cannot be differentiated into separate fields with that distinctness which was possible in the case of coal. There are, however, some well defined iron producing zones which will be considered in the progress of the discussion.

The ores of Tidewater have only a local development, and are not of commercial importance.

A variety of ores occur in the crystalline rocks of the Piedmont division, the most abundant being limonite (Fe^2O^3, $2H^2O$), magnetite (Fe^3O^4), and pyrite (Fe_2). Workable beds of limonite are found in Buckingham, Louisa, and Fluvanna Counties. Limonite, hematite, and the magnetic ores occur in Amherst, Bedford, Campbell, Franklin, and Patrick Counties. There is a productive zone of the hydrated oxide ores along the western flank of the Blue Ridge, at the contact of the Potsdam sandstone and the Calciferous and Trenton limestones. The ores have been mined in this zone in the counties of Page, Augusta and Rockbridge.

The contact between the Utica and Hudson shales, and the Trenton limestone is also a productive zone, in which the pocket formation is characteristic. The development has been extensive in the Cripple Creek region, and mining is in active and scientific progress in Pulaski, Wythe, Smyth and Washington Counties. The ores are the result of the decomposition of the ferriferous limestone and iron carbonate, and is therefore usually limonite. The adjacent limestone affords an excellent flux for the reduction of the ores. These ores average from 48 to 55 per cent of metallic iron, and from 0.1 to 0.3 per cent of phosphorus.

The pyrites have no commercial value as iron ores, but are used in the manufacture of sulphuric acid. They occur in lenses in the crystalline rocks, and are disseminated to a greater or less extent through all of the metamorphic rocks. In Louisa County there is a vein two miles in length, with a thickness of fifteen to twenty feet, which has been opened to a depth of 600 feet. There is another mine operated at Dumfries, Prince William County. In both of these localities the pyrite is associated with Cambro-Ordovician slates and schists.

Throughout the Appalachia region iron ores are associated with the Silurian, Devonian, and Carboniferous rocks. The beds of the coal series, being thin and running low in iron, have not been utilized. The Oriskany sandstones (Devonian) and the Clinton sandstones and shales are the two most productive iron zones of the region. W. B. Rogers affirmed more than half a century ago, that iron ore deposits are exposed "almost in every ridge of which the formation composes a part." The beds are well exposed in Brushy, Gap, Rich Patch, Mill, Big North, and Little North Mountains. The iron ore zone constitutes the upper part of the Oriskany sandstone, and limonite is the predominant ore.

The next clearly defined series is that of the Clinton series (Middle Silurian), which consist of sandstones and shales, and is persistent from New York to Alabama. The predominant ore is hematite, which has been changed into limonite through hydration.

The total iron production of the state was 310,500 tons in 1904, and 510,300 tons in 1905. During the first half year of 1906 it was 257,800 tons, and the indications are that the production for the second half year of 1906 was greater.

Lead and Zinc. The ores of these metals are associated in all of the productive mines of the state. They are most abundant in the Lower Silurian (Ordovician) limestone of Wythe, Pulaski and

Smyth Counties; and have been mined to a limited extent in Roanoke County. The carbonates, smithsonite and cerussite; the blendes, galena and sphalerite; and the basic silicate, calamine predominate. Of these the carbonates are the most abundant, and are residual products derived from the disseminated sulphides through the weathering of the country rock. Until recently but little attention was given to utilizing the sphalerite. Galena occurs in Nelson and Louisa Counties, but the mines are not in operation, and cannot be said to be commercially important. Different ores of zinc and lead have been identified in Franklin, Montgomery, Giles, Bland, Tazewell, Russell, Scott, and Wise Counties, some of which may afford important supplies when developed.

The first lead mine operated in the state was that of Austinville, Wythe County, in 1750, which continued in operation until the beginning of the Revolutionary War. The associated zinc ores were not utilized until 1879, from which date the zinc products have steadily increased, while the lead product has proportionately decreased. In 1905 the Austinville mine produced 651 tons of zinc concentrate, 348 tons of low grade zinc oxides, and only 89 tons of lead concentrate.

Manganese. The manganese ores are not being developed at this time.

The most productive zone is the upper contact of the Potsdam (Cambrian) quartzite, in which the oxides, psilomelane and pyrolusite predominate. They occur usually in concretionary masses, disseminated through the residual clays, which, together with the ores, have resulted from the decomposition of the overlying limestone and shales. Mines have also been operated in Nelson, Amherst and Campbell Counties. The total production in 1905 was only 3,054 tons.

Manganiferous iron ores occur in Amherst, Nelson, Augusta, Bath, Alleghany, Rockbridge, and Botetourt Counties.

Building Stones.

Since all of the geological groups are represented, the state naturally possesses a great variety of building stones. Many of the varieties are superior in quality, and if the industry were developed on a larger and more economical scale it would become a most important source of wealth. Notwithstanding the abundance of the resource, Virginia is a large importer of both building and decorative stone. The explanation is not difficult. The stone industry becomes very profitable on a small margin of profit, if operated on a large scale with the most improved machinery. The Virginia operations are as a rule small and inadequately equipped, which makes it easy for other states to quote lower prices on contract work.

The total value of the 1904 product was $1,097,500, of which a granite represented almost half.

Granite. All of the granite quarries are situated along the eastern border of Piedmont between the counties of Stafford on the north and Brunswick on the south. Chesterfield, Henrico, Dinwiddie and Spottsylvania are the largest producers. The granite of this zone is a light gray, which in quality and appearance does not differ materially from the New England granites. The following important buildings were constructed of Virginia granite: State, War and Navy Building at Washington; Post Office Buildings at Philadelphia and Harrisburg, Pennsylvania; Post Office Buildings at Richmond and Petersburg, Virginia; and the Custom House at Richmond.

The 1904 output was valued at $510,800, which is almost double the total valuation for the preceding year.

Gneiss. The gneiss of Campbell, Halifax, Charlotte and Prince Edward Counties is a very durable and easily worked building stone, while that of Albemarle, Nelson, Amherst, Bedford, Franklin and Patrick Counties contains much iron pyrites which makes it an inferior building stone.

The Female Orphan Asylum at Lynchburg was constructed of gneiss quarried in Campbell County.

Limestone and Marble. Limestone is widely distributed throughout the state, with the exception of Tidewater, and here its unconsolidated counterpart, marl, exists in abundance. The quality of the stone is even more varied than the distribution. Almost all of the beds east of Appalachia have been metamorphosed to a greater or less degree. The crustal movements which give rise to the metamorphosed changes produced, in the form of numerous faults and fractures, such widespread physical changes as to make the conditions different for each locality. It is therefore impracticable to discuss the physical properties of the limestones of the state either regionally or zonally. In the Valley I have seen quarries abandoned because of the inferiority of the stone, and another opened within a few hundred yards gave stone of the finest quality.

Limestone is used chiefly in heavy construction work such as building foundations, bridges, culverts, etc. The rapid introduction of concrete is decreasing the demand for the stone, and statistics show a material decrease since 1903.

Some of the marbles found in the state are high grade in color and texture, and practically free from impurities. A white variety occurs in Loudoun County which G. P. Merrill of the Smithsonian Institute says is not excelled by any marble quarried in the United States. White marble is also reported from Rockbridge County. In Augusta County there is an encrinal marble, the black variety of which is very abundant. Gray marble occurs in Rockingham, Botetourt and Buchanan Counties; brown in Wythe County; variegated in Washington County; and red in Giles, Wythe and Scott Counties. Since so little is known as to the extent of any of these, the possibilities of the industry cannot be predicted.

Sandstone. The Triassic sandstone is the best known Virginia variety and has been the most extensively worked. The White House at Washington was constructed of this stone quarried in Aquia Creek, Stafford County.

In the Piedmont region there is every grade from a fine grained red to gray crystilline quartzites and heavy conglomerates. A superior quality of bluish gray sandstone (Potsdam) is quarried in Campbell County which is largely consumed in building construction at Lynchburg.

Sandstone and conglomerate beds of varying grades and thicknesses occur throughout the Appalachia region, alternating with shales, coal and limestone. The Millstone grit, because of its greater durability, is the most persistent and prominent of the series. It has for many years been used extensively in the manufacture of millstones, and has had a limited use in construction work. It can be used with good architectural effect for cornice, window and door trimmings.

Clays. There is a great abundance and variety of sedimentary clays throughout the Coastal Plain region, occurring usually in lenticular masses, interstratified with the sands and loams. The clays of Piedmont, the Valley and Appalachia are for the most part residual, and are different for the different formations from which they have been derived. The most common impurities of the sedimentary clays of Tidewater are quartz, iron oxide, gypsum and calcite; of the Piedmont residual clays, mica, iron oxide, pyrites, and quartz; of the residual clays of the Valley, iron oxide, calcite and quartz; and of the residual and sedimentary clays of Appalachia, iron oxide, carbonate and sulphate, pyrite, quartz and carbonaceous material.

The development of the industry has been limited chiefly to the regions contiguous to the cities of largest demand, which explains its importance in the vicinity of Washington, Richmond and Norfolk. The brick, terra cotta, tile and earthenware clays are widespread and have had the largest development. The Cambrian and Silurian shales could no doubt be utilized in the profitable production of clay products. Some of the Carboniferous shales are quite similar to those of Maryland and Pennsylvania, out of which a superior grade of pressed brick is manufactured. The Jurassic shales of the Richmond area contain too much sand and grit to be utilized with profit. Kaolin occurs in Augusta, Wythe, Buckingham, Goochland, and Cumberland Counties, but has been little developed.

The total value of the clay products of the state was estimated at $1,708,728 for 1904.

VIRGINIA TRADE AND COMMERCE.[1]

The decade following the Civil War marked the beginning of a new era in the industrial and commercial development of the state. We shall, therefore, discuss briefly the factors which gave impetus and foundation to the succeeding order. The immediate and most urgent demand was to become self-sustaining, by the production of food-stuffs and clothing, since all of the surplus had been consumed during the four-years' struggle, which centered on Virginia territory, and from which the people of the state suffered most. Co-ordinate with this was the demand for restoring the property losses incurred. Notwithstanding thousands of negoes migated to the cities of the North and the cotton fields of the South, there was still a surplus of negro laborers, but thoroughly disorganized and demoralized; and few of the landowners had the capital with which to employ labor. Capital far in excess of the surplus had been invested in negroes, so that bankruptcy was more general than surplus capital. The large tobacco surplus was, therefore, ruled out by the conditions at home, and a diversified agricultural production on a small scale made necessary. This initiative was promoted and fostered by conditions outside of the state. Cotton rose to fabulous prices, and in the cotton states all energy was bent to a maximum production, They could not afford to raise poor corn and wheat crops on good cotton land, when cotton was selling at fifty to sixty cents per pound. There developed, in consequence, a great demand for provisions in the cotton states. The border states—Virginia, Tennessee, and Kentucky—were adapted to grains, grasses, and the live-stock industries, but not to cotton. The stimulus for diversified agriculture in these states was therefore much intensified by the situation in the cotton states. But the situation in the North was no less favorable toward this same development. While the South has been purchasing negroes and growing negroes, the North had been building factories, extending trade, and accumulating a large surplus. As the war progressed prices rose and Northern industries flourished, as a result of which there was more money in the North at the close of the war than at the beginning. Following the war the demand for cotton and woollen goods, farming implements, and labor-saving machinery was unprecedented, and so the Northern factories entered upon a new era of development and prosperity, which rapidly increased the urban population. As a result, instead of the manufacturing states having a surplus of food-stuffs, they could scarcely supply the home demand.

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[1] This part of the study appeared in August issue of BULLETIN of American Geographical Society, and is used by permission of that Society.

Without discussing the beneficial effects of emancipation upon the production and trade of the state, it must be apparent to every student of Virginia's economic and industrial development that the change in the system was most fortunate. It induced an unwonted economy, which of itself was a discipline of far-reaching importance; discontinued the general practice of wholesale timber destruction; labor-saving machinery was purchased; the soil better cultivated; the property improved; the children schooled; and the surplus gradually increased.

Virginia is just now entering upon another era of industrial development, which may be characterized as the *era of scientific agriculture and diversified manufacture.* This was made possible by the sounder and more economic bases of the *post-bellum* policies.

We shall discuss the present trade conditions under the following divisions: Intra-State Commerce, or the sale and exchange of products between different sections of the state: Inter-State Commerce, the trade relations with other states; and Foreign Commerce.

Intra-State Commerce.

Regional.[2] The distinct zones of production conform in general to the natural geographic divisions.[3] *Tidewater* produces a large surplus of garden products, peanuts, fish, and oysters, and these are the most important shipments westward; but they are more than balanced by the coal, lumber, hay, grain, and tobacco received from the western part of the state for home consumption.

Piedmont[4] produces a smaller surplus proportional to its area than either Tidewater or the Valley, but its productions are so varied that the deficiency of one part of the region could be supplied from the surplus of another, if developed with reference to economic

[2] Production and trade of cities will be considered under a separate head.

[3] The natural geographic divisions of the state are Tidewater, or the Coastal Plain; Piedmont, or the plateau region; the Blue Ridge; the Valley, and Appalachia.

[4] Middle Virginia is here considered as a part of Piedmont.

adaptation. Coal from Appalachia is the most important shipment into Piedmont. Tobacco[5] constitutes the largest surplus of southern Piedmont, and live-stock the largest of northern Piedmont. Fully three-fourths of the total tobacco crop is manufactured within the area. The important manufacturing and distributing points are Richmond,[6] Petersburg,[7] Lynchburg, Danville, Chatham, and Martinsville.

The trade of the *Blue Ridge* consists chiefly of the sale of live-stock, lumber, and fruits, and the purchase of furniture, groceries, clothing, and machinery. This plateau section has more live-stock per square mile than any of the other geographic divisions.

The *Valley* produces a large surplus or grain, hay, live-stock, winter vegetables, and fruit. A large part of the provision surplus of the southern Valley is marketed in the mining districts of Virginia-West Virginia, which is contiguous territory. There is still a small surplus of forest products, but the cultivatable land is being rapidly deforested, and cannot be reckoned as an important and permanent factor of trade.

The wealth of the Valley is greater *per capita* than is that of any other division, which makes it a large purchaser of farming implements, household furniture, and general merchandise.

Appalachia produces a large surplus of coal, coke, lumber, and live-stock. The coal is shipped to all parts of the state. The cattle are marketed locally, in the eastern cities, and as exports. Tazewell, Russell, Craig, Bland, and Giles Counties form the agricultural belt of Appalachia, by virtue of a large part of the area having a strong residual limestone soil. Live-stock—especially small cattle, and sheep—and lumber are the important sources of revenue in northern Appalachia.

The mining counties—Wise, Russell, Buchanan, Dickenson, and Lee—are large purchasers of provisions, merchandise, mining machinery, draft horses, and alcoholic drinks.

Cities.[8]

Since no separate record of the state and inter-state traffic is kept, it is impossible to give figures as to the exact amount of shipments from the manufacturing and distributing points. The discussion is, however, based upon a careful study of the inter-state and foreign trade, reports and statements from the various Boards of Trade, and personal observations in representative sections.

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[5] Sixteen counties in Piedmont produced in 1900 more than 3,000,000 pounds each. Pittsylvania ranked first, 17,088,550 pounds; Halifax second, 13,077,200 pounds; and Mecklenburg third, 7,368,220 pounds.

[6] On the Piedmont-Tidewater boundary.

[7] Floyd, Carroll and Grayson are the only counties situated wholly in this division.

[8] This part of the discussion relates only to the *intra-state trade* of the cities.

Richmond ranks first in population; is served by more railroads than any other point in the state; is largest manufacturing, jobbing, and distributing center; and is the most centrally located[9] city in the state. There were 1,554 factories in operation in 1906, the sales of which aggregated $77,432,692. Of the manufactures, tobacco led with 59 factories, and a total product of $20,195,336. The following valuations are given for the respective classes of manufactures: Iron products (including farming implements), $9,876,482; fertilizers, chemicals, iron and cement products, $8,376,120; and leather products, $3,361,077. The jobbing trade for 1906 aggregated $61,524,275. All of the important articles of manufacture are sold throughout the state.

The largest purchases made by the city consist of tobacco, lumber, grain, flour,[10] leather, vegetables, and poultry products.

Greater Norfolk (including Norfolk, Portsmouth, Berkley and U. S. Navy Yard).—Norfolk is not only Virginia's most important port, but one of the most important in the South. Among southern ports it ranks first in lumber, first in peanuts, second in coal, and fourth in cotton shipments.

The city is situated at the junction of the southern and western branches of the Elizabeth River, which is tributary to the James River Estuary, of which Hampton Roads is the connecting channel with the Chesapeake Bay. The James River has no bar at its mouth, and there are 30 feet of water at low tide. The distance of Norfolk from the ocean is 32 miles, and from Hampton Roads 8 miles. As to the special advantages of the Norfolk harbor, I quote from the report of Commodore M. F. Maury: "Norfolk, be it remembered, with its deep waters, spacious harbors and free outlet between the Capes of Virginia to the sea, occupies geographically what the early discoverers thought would be, and what physical geography claims

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[9] If we draw a circle around Richmond as the center on a radius which will inclue Accomac County, this circle will include four-fifths of the total Virgina territory.

[10] The Richmond Grain and Cotton Exchange received during 1905 4,500,000 bushels of grain, and 162,200 barrels of flour.

is, the most commanding commercial position along the whole Atlantic seaboard of the United States. Its natural advantages make it so."[11]

There are 30 miles of wharf frontage. The outer harbor contains 50 square miles of anchorage ground, with a depth of 50 feet; and the inner harbor (Elizabeth River and its branches) has 1,000 acres of anchorage ground, with a depth of 28 feet. Portsmouth is just across the river from Norfolk, and has a harbor frontage of one mile.

The traffic of the southern branch of the Elizabeth River in 1905 showed a great increase over any previous year, being about 11,000,000 tons, valued at more than $500,000,000.[12]

Norfolk ranks first as a rehandling, and foreign and domestic export point; and in the variety and volume of manufactures ranks next to Richmond. The largest enterprise is the United States Navy Yard at Portsmouth, which employs more than 2,000 wage-earners at a total cost of $2,000,000 per year. The following important industries enter into the general supplies and traffic of the state: Fertilizer, tobacco, lumber and iron mills, cotton factories, cotton compresses, packing-houses, peanut factories, fisheries, brick factories, farming implements, and shoe factories. The total value of Norfolk manufactures was estimated for 1905 at $34,400,000. Fertilizer, tobacco (manufactured), canned meats, peanuts, and oysters are shipped to all parts of the state. The Norfolk jobbing and wholesale houses do a large business in Tidewater, eastern and southeastern Piedmont, and North Carolina. It is the largest horse market in the South, the aggregate sales of 1905 being $2,500,000.

The volume of the traffic going into Greater Norfolk far exceeds that of any other point in Virginia. The most important classes are in the order of tonnage: Lumber, iron, coal, grain, garden products, live-stock, cotton,[13] and tobacco. The lumber comes from Appalachia, the Valley, Blue Ridge, Piedmont, and from North Carolina, Tennessee, and West Virginia; the coal from Appalachia, the States of Kentucky and West Virginia; the grain and live-stock from all parts of the state, and the Middle West; the garden products from Tidewater and Piedmont chiefly; the cotton from Virginia, North and South Carolina; and the tobacco from Piedmont.

[11] Physical Survey of Virginia, M. F. Maury, 1876, p. 20.

[12] Report of Chief of Engineers, U. S. Army, 1906, p. 238.

[13] 822,930 bales of cotton shipped from Norfolk in 1905, valued at $40,000,000.

Newport News[14] is situated on the northern shore of Hampton Roads, 20 miles due east from Cape Henry. The depth of the water off piers is 60 feet. There are 10 miles of water front, and good anchorage. The port is served by 18 regular steamship lines. The total tonnage for 1905 was 4,717,858 tons,[15] valued at $89,816,686. About three-fourths of the total tonnage consisted of coal and coke. It is the seaboard terminus of the Chesapeake and Ohio Railroad, which intersects more intra-State lines than any other road operating in the state, and about three-fourths of its traffic is supplied by the connecting lines. The most important classes of coast-bound traffic originating in Virginia are: Grain, live-stock, lumber, tobacco, and garden products. Newport News is an important distributing center for merchandise, furniture, farming implements, and machinery, which go to all parts of the state north of the James River, and a small part is diverted to the connecting lines from the South.

Lynchburg.[16] As an inland railroad center Lynchburg ranks next to Richmond in importance. Although Lynchburg is now entirely an inland town, its early importance as a trade center was fixed by the James River Canal, which was the most important transportation route from the seaboard to the interior part of the state, until the construction of the Norfolk and Western Railroad. Lynchburg was the handling station of all goods destined for southwest Virginia, western North Carolina, and the northern part of the east Tennessee country. The old Lynchburg-Knoxville pike was constructed for the convenience of this traffic. The James River ceased to be navigable above Richmond when it became unprofitable to operate the canal, after which time Lynchburg's importance was due to the trade stimulus as fixed by the old transportation régime, and the later railroad facilities. In total manufactures and the jobbing trade it ranks next to Norfolk. The 1906 factory output was valued at $15,000,000. The important manufactures are: Shoes, foundry products, tanning extracts, cotton goods, flour, and farming implements. In the manufacture of shoes it ranks first among the cities of the South. The products are sold throughout Piedmont, and the western part of the state. Lynchburg is the largest shoe-distributing point in the South, and its shoes are sold, not only in all parts of Virginia, but throughout the South Atlantic States.

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[14] Population, 28,749, in 1906.

[15] Tonnage in 1902, 2,663,669 tons.

[16] Population, 20,000, in 1906.

Roanoke[17] may be justly termed a railroad town, as its size and trade have been largely produced by the Norfolk and Western Railroad, of which it is headquarters. The company employs 4,700 operatives, who have their homes in the city. It is situated on the main line (Bristol-Norfolk) of the Norfolk and Western Railway, and is the southern terminus of the Shenandoah Valley and the northern terminus of the Roanoke and Southern Railroads, both of which are owned and operated by the Norfolk and Western. The geographic location and railway service, therefore, make it the eastern gateway into southwest Virginia, and the southern gateway into the Valley. The jobbing and retail trade have steadily increased, and manufacturing enterprises have begun to be extensively developed. Roanoke will be a division terminus for the trans-State Tidewater Railroad, which, added to its present prosperous trade relations, bids fair to make it the largest and most important exclusively inland city of Virginia. The most important outgoing shipments are: Groceries, iron products, general merchandise, and alcoholic drinks; and the most important incoming shipments are lumber, grain, vegetables, and tobacco.

Bristol[18] is located on the Virginia-Tennessee boundary, and, as the terminus of five different railroads, is an important rehandling station and distributing center. It is southern Appalachia's most direct gateway to the south and east, and is, therefore, an important trade center for that region, and the southernmost portion of the Great Valley.

Three of the railroads operating from the city as a base have their General Offices there. It is also the headquarters of the Virginia Iron, Coal and Coke Company, with a capital of more than $10,000,000. The most important manufactures are: Iron, lumber products, paper, tanning extract, tobacco, flour, and chemicals.

The value of the manufactures and trade has been more than doubled in the last decade. The manufactures of 1906 are valued at $10,500,000; exclusive of lumber, coal, and iron products, valued at $10,000,000. The jobbing trade aggregated $9,000,000, which shows Bristol's importance as a distributing point.

[17] Population, 30,000, in 1905.
[18] Population, 15,000, in 1905.

Danville[19] is at the crossing of the Southern, and the Danville and Western Railroads. It is the largest loose-leaf tobacco market in the world, handling from 45,000,000 to 55,000,000 pounds annually. Tobacco is the principal farm product of the region, and the most important article in trade. The city is situated on the Dan River, which has sufficient volume and favorable fall for the establishment of large factory enterprises. Already two cotton mills have been established, with a combined capital stock of $4,500,000, which furnish employment to more than 4,000 wage-earners.

Inter-State Commerce.

Though Virginia is making marked progress in the development of manufacturing enterprises, these have not reached such proportions as to make the state an important purchaser of raw materials. The rapid development of cotton factories creates an increasing demand for raw cotton. In 1900 there were only 7 factories within the state; while in 1905 there were 32, which consumed 57,223 bales, an excess of 39,049 bales over the total production of the state. The most important shipments, therefore, from other states for domestic use consist of manufactured products. There are large shipments from other states into Virginia, destined for eastern and foreign markets, which require rehandling; and for these due allowance must be made in the consideration of the aggregate port trade, since no separate record is kept at the ports of the traffic originating within the state, and that from without the state. This rehandling traffic creates a large demand for labor, sorting, transfer, and shipping facilities, and in that way becomes an important factor in the state's traffic and trade. The products consist chiefly of lumber, cotton, and tobacco from North Carolina; lumber and live-stock from Tennessee; and lumber, coal, and coke from West Virginia.

Virginia produces a large surplus of raw and manufactured tobacco, garden products, forest products, coal and coke, live-stock, and peanuts; and a small surplus of fruits, poultry products, leather, meats, and iron. These constitute the bulk of the outgoing tonnage, the major portions of which are sold in the North Atlantic and New England States. The most important markets are: New York, Philadelphia, Boston, Baltimore, and Washington. Large shipments of live-stock are made to Lancaster, Pennsylvania, from which point they are sold to the farmers of Pennsylvania for winter fattening.

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[19] Population in 1900, 16,520.

The inter-state shipments of live-stock, tobacco, and vegetables are largely by rail. More than three-fourths of the seaboard lumber traffic, and more than one-half of the seaboard coal shipments, are by water. Cotton is shipped almost exclusively by water. The coastwise trade centers in Norfolk, Newport News, and Richmond.

Foreign Commerce.

The total imports into the state for 1905 were valued at $10,885,628, and the exports at $23,409,119. The imports were largely general merchandise, and the exports coal, live-stock, grain, flour, cotton, tobacco, lumber, and meats.[20]

Newport News. The total exports[21] from this port for 1906 were valued at $18,693,803, which is an increase of 18 per cent over 1905.[22] The following are the important classes, in the order of valuation: Flour, $3,095,649; lumber, $1,454,096; lard, $1,231,201; copper, ingots, etc., $1,100,623; tobacco, $1,038,483; coal, $925,275, linseed oil cake meal, $869,632; cotton, $506,056. The imports aggregated $2,723,788, an increase of 26 per cent over 1905.[23] The following are the most important, in the order of valuation: Burlap, $376,388; jute bags, $336,025; plate-glass, $265,546; alcoholic drinks, $231,903; earthenware, $165,403; and cocoanut oil, $142,728.

Norfolk and Portsmouth.[24] The following are the important exports from this port, in the order of valuation:[25] Lard, $1,180,441; coal, $1,111,725; lumber, $1,000,000; cotton, $943,031; grain and flour, $780,487; tobacco, $329,729; and cattle, $305,300. The total exports were valued at $7,640,800 for the year ending December, 1905, as compared with $8,256,519, the total imports for the same year, which consisted of merchandise, chemicals, alcoholic drinks, burlaps, etc. Norfolk is the ocean terminus of the Tidewater railroad, which crosses the state from east to west. Its construction is for the purpose of marketing the coal from one of West Virginia's richest fields. The grading in the Virginia portion is nearing completion, and the contracts demand that the road be ready for traffic by January 1908. It will probably be the heaviest coal carrier in the state, and will increase the coastwise and foreign traffic out of Norfolk at least 25 per cent.

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[20] The coastwise trade for the same year was about twelve times the total foreign trade.

[21] Newport Custom House Report, 1906.

[22] Exports in 1905, $15,750.310.

[23] Imports in 1905, $2,154,650.

[24] In the same Custom House district.

[25] 1905.

MANUFACTURES.

Virginia possesses all of the economic essentials for becoming an important manufacturing state. Coal, iron and lumber, the three most important products for the establishment of diversified industries, are abundant. The water-power is superior in fall, volume, regularity and distribution; and adequate for running thousands of large plants at a minimum cost. Piedmont, the Valley, and southern Appalachia mark the zone for the future development of factory enterprises. The streams have their sources in the forested regions of the state, which fosters a regular summer flowage, and the rainfall has a monthly distribution of unusual regularity. The transmission of electric power for manufacturing purposes is just beginning to be utilized, and is destined to inaugurate a period of unprecedented development.

No state in the Union is more favorably adapted to diversified agriculture. Tidewater is ideally adapted to trucking; Piedmont to tobocco, peanuts and fruits; the Blue Ridge and Appalachia to fruits and live-stock; and the Valley to grain, grass and live-stock. It is a conservative estimate to say that the agricultural production can be increased by ten-fold, and with the growth of the state's industrial communities will come the development of intensified agriculture. In this way the manufacturing and agricultural interests will lift each other to a plane of more profitable realizations.

The climate is almost ideal, having an average mean annual temperature of 56°, and a well distributed rainfall, which averages thirty-five to forty-five inches annually. The factory zone is from 400 to 2,000 feet in elevation, and the summers are never oppressively hot, nor the winters extremely cold. These are items of supreme importance to the enforced laborer, in that they regulate his health, happiness, capacity and profit.

The total value of the manufactures in 1899—according to the 1900 census—was $132,172,910. A compilation of the most accurate industrial statistics obtainable for 1906 gives a total product valued at more than $175,000,000,—an increase or more than thirty per cent. The following are the most important classes of manufactures, in the order of valuation: Tobacco, food products, forest products, iron products, textiles, farming implements and machinery ship building, leather products and chemicals.

Tobacco Manufacture. The commercial world is indebted to Virginia for the rise and progress of the tobacco trade, and for most of the improvements inaugurated in the manufacture of plug tobacco. Jesse Hare of Richmond discovered in 1862 the art of sweetening tobacco by the use of licorice. James Thomas, Jr. was the pioneer tobacco manufacturer, and his factory was the largest in the world when destroyed by fire in 1853. He invented the light-pressed plug tobaccos, which have subsequently become so popular.

In total production Kentucky now holds first rank, North Carolina second, and Virginia third. Virginia is second in the manufacture of cigarettes, fourth in the manufacture of plug tobacco, ninth in the manufacture of smoking tobacco, and first in that branch of the industry known as stemming tobacco and rehandling. The total manufactured product of 1906 is valued at more than $25,000,000. Richmond, Petersburg, Danville, Norfolk and Lynchburg are the most important manufacturing centers.

Food Products. There were 1,726 flour and grist mills in the state in 1900, of which 83 were classified as merchants' mills. The maximum daily capacity of the mills is estimated at 285,000 bushels. There is no appreciable increase in the number, but the capacity of the mills is being rapidly increased. The total product consumed is about equal to the total production.[1] The margin of profit on flour is less than on any other class of manufactures.

The canning industry is developing slowly throughout the state. The total value of the annual product[2] is now more than twice that of any other southern state; but Maryland with less than one-third the area, produces more than eight times our total product. Virginia is so well adapted to the successful growth of both fruits and vegetables, and the demand for this class of food product is increasing so rapidly, that we may look with confidence to its becoming one of the leading industries.

Iron Products. The Virginia furnaces use only domestic ores.

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[1] 1899 wheat crop, 8,907,510 bushels; total product manufactured in state, 8,562,510 bushels.

[2] 1900, $533,542.

They are located with reference to the supply of fuel, ore, and flux. Limestone and inferior ores constitute the flux at all the furnaces. The limestone is generally distributed throughout the ore producing sections, and the coal is in close proximity to the richest ore deposits. Coke is the form of fuel used in all the larger works. The furnaces consumed 638,000 tons of coke in 1900, at an average cost of $2.56 per ton. During the same year 437,508 tons of fluxing material were consumed, at an average cost of but a little more than fifty cents per ton. Sixteen of the twenty furnaces in operation in 1900 were blast furnaces, representing a capital of $5,027,752. The total value of the product from these sixteen furnaces was $6,505,218. The average price per ton was $26.87 in 1880, and $15.20 in 1900.

The average price of the Alabama product was $25.19 per ton in 1880, and $11.21 in 1900.

Ore having as much as 0.10 per cent of phosphorus cannot be converted into Bessemer steel, and for this reason none of the Virginia ore can be treated by the Bessemer process. The distribution of the production as to grades is as follows: Foundry, 304,466 tons; basic, 72,981 tons; and forge, 28,661 tons.

The furnace operations have increased since 1900, and the product represents a total annual valuation of at least $10,000,000.

The locomotive and car construction industry is increasing very rapidly. The total value of the product in 1900 was $6,277,279, as compared with $1,504,995 in 1890. Richmond is the most important center.

The phenomenal development of the Norfolk Navy Yard by the United States Government during the last decade has brought Virginia to the fore-front in this special branch of manufacture. This plant is situated on the Portsmouth side of the Elizabeth River. which connects direct through Hampton Roads with the Chesapeake Bay. In area and the amount of capital invested it is the largest navy yard in the United States. The plant covers eighty-three acres, extending along the water-front three-quarters of a mile. It was established at a cost of $19,262,193, and is thoroughly equipped with twenty-five immense store-houses and machine shops, two dry docks, electric light plant, power house, and marine barracks. The total capital invested in shipbuilding increased from $4,467,860 in 1890, to $22,476,618 in 1900, an increase of 403 per cent. It represents 29.1 per cent of the total shipbuilding capital in the United States. There was an increase of 4,671 per cent in the capital invested in 1900 over 1890; 2,770 per cent in the number of wage-earners; 2,714 per cent in the wages paid; 3,416 per cent in the cost of materials used; and 1,975 per cent in the value of the products.

Textiles. Cotton factories are springing up rapidly at different points in the southern part of the state. There were only seven factories in operation in 1900, while in 1905 there were thirty-two, which consumed in that year 57,223 bales of cotton. All of them manufacture the coarser grades of cotton fabric. They are located on the different streams of Piedmont, the Blue Ridge and the Valley, where water-power is most easily and economically available. The proximity to the cotton fields of North and South Carolina, superior water power in the midst of splendid agricultural resources, and the short haul shipping facilities to Norfolk, the finest harbor of the Atlantic, are factors which insure the rapid development of the cotton mill industry.

The annual output of the factories in operation is more than $4,000,000, exclusive of the hosiery and knit goods factories, with an annual output of $2,000,000.

The hat, carpet and felt industries are not represented in the state. There is no good reason why these industries should not become as profitable in Virginia as they have proven to be in New Jersey, Pennsylvania and New York.

The manufacture of woolen goods has made but little progress in the past twenty years.

There are three silk factories in operation which employ about 500 laborers. The annual product is valued at $1,000,000.

General Remarks.

Since the close of the Civil War Virginia has been of necessity a shipper of raw products, and a purchaser of manufactures. As the capital surplus slowly accumulated, factory enterprises began to make their appearance. The agricultural and industrial prosperity of the past decade has rapidly increased the surplus, and during that time there has been a phenomenal growth of industrial enterprises. Northern manufacturers began to feel the change in the tide, simultaneously with which, northern capital began constructive operations in the South. Northern capital dominates in the railroad construction, but in mining and manufacture southern capital is closely associated, and though Virginia millionaires are not so numerous, it would be somewhat surprising to know how many have gained that credit standing during the last quarter-century.

GRAIN
LIVESTOCK
FREDERICK
Winchester
Harpers Ferry
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LIVESTOCK
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CLARKE
V
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SHENANDOAH
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FRUIT
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CULPEPER
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isonburg
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TOBACCO
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CKINGHAM
CUMBERLAND
TOBACCO
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VEGETABLES
AMELIA
TOBACCO
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EDWARD
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NOTTOWAY
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PEANUT
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VEGETABLES
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GEOGRAPHY WITH A PURPOSE

PROFESSOR J. RUSSELL SMITH.

Some educational institutions are composed in their non-technical sides of a collection of departments in which each branch of learning stands isolated and independent—its own excuse for being. Correlation has remained at a negligible minimum. In such teaching the estimate of knowledge is a little like virtue, which is its own reward. The isolated fact is thrust into the student mind and is esteemed because it is a fact, not because it can serve any purpose to the owner of the mind in which it is lodged.

It is otherwise with the esteem of geography in the University of Pennsylvania, for here it has a purpose, and aims at correlation in a very definite scheme of education. The geography of this University is housed with the Wharton School of Finance and Commerce. This school, the pioneer of its kind, was endowed by a business man whose feats in industry, finance and self-education showed him to possess a great intellect, and caused him to desire that young men should have within their reach what he considered to be a more useful kind of education than that commonly available. He therefore endowed the Wharton School of Finance and Economy (later changed to Finance and Commerce) for the definite purpose of fitting the young man for life by placing at his disposal a college course that should give a training to fit for the two goals of business and citizenship. This has resulted in a college course centered upon the present rather than upon the past, dealing with the problems of our life rather than with those of classic and remote epochs. This emphasis on the present is studied by a required minimum of literature, history and foreign language which the student must take.

A quarter-century of work along these lines has developed a school with rapidly increasing attendance and a specialized and differentiated curriculum permitting a wide variety of election to the student. On the business side a course may be selected giving special attention to accountancy, to banking, to merchandising and manufacturing (on its non-technical side), to transportation and commerce, to preparation for the law and to the handling of real estate. On the side of citizenship there are many courses dealing with the problems and concepts of society, and definite groups of courses preparing for social work and for government service.

These possibilities of specialization come in the later years of the course which in its freshman year is introductory and rigidly prescribed. The sophomore year is largely free, but the student who will take the junior and senior work in certain fields must take certain sophomore work in preparation for it. .

In the freshman year is a prescribed course in physical geography. Being prescribed and being in the very foundation of such a group of courses that are given and taken because they are supposed to be useful, this course differs from the usual physical geography course. The principle guiding the selection of material for this course is a square reversal of that sometimes used. No attempt is made to cover the whole field of physical geography or to go systematically over it. The object constantly before the instructor in this and in the other geography courses is not the earth but the student who should benefit by a course acquainting him with some of the fundamental conditions of modern life which he should be equipped to understand as far as possible.

Some men have recently called physical geography a chapter in geology. The dynamic phases of it have of late become so thoroughly worked out that a course or courses may easily find great abundance of material in this field alone. The explanation of just how the earth was cut and planed and chiseled, warped and twisted, and ground into its present form is exceedingly interesting. But when it comes down to the final decision of what shall you teach a freshman when you have but a few hours on a subject like mountains, for example, it at once becomes apparent that there must be much selection and omission of material. The mountain may be looked at as a piece of earth sculpture—a study in mechanics pure and simple, and unconnected, or it may be one of the great shaping and controlling forces of man's activity. When these two points of view are brought up for election the Wharton School needs the latter and takes it. For the future citizen and business man there seems to be no possible ground for hesitation in the choice between the telling of just exactly how a certain land form came into existence and the telling of how, for example, the land forms of Appalachia have given us the Kentucky-Carolina-Tennessee mountaineer. In other words the course starts with the land form or other physical fact and faces the dilemma of choosing between delving into natural science and explaining it, or of delving into social science and showing its human result. In this choice the human result weighs heavier. The interest of the student usually brings up the other also, and a mastery of physiography is considered as essential for the instructor as it is in institutions devoting themselves to more technical instruction.

Another example will help to show this fundamental difference that must underlie any science or any course of instruction or course of lectures.

A science must in its presentation have some basis for systematic arrangement. A course of lectures by a German geographer of note, dealing with snow, ice, and glaciers, gave equal emphasis to the snows of the top of Aconcagua, of Grinnell Land, of the high Alps, and of the plains of Saxony. This was done because snow was interesting for the mere reason that it was snow. It was being studied for its own sake by a scientific geographer. Human geography deals with those phenomena having influence upon the economic status of man and the consequent economic responses. If snow claimed a place here it would be through its influence upon winter wheat and other vegetation, upon water supply and floods, upon lumbering in the northern forests, upon transportation by sledge, upon the housing or pasturing of cattle by winter, etc. The snows of Aconcagua and the high Alps would be passed by unless it were shown that they became of use to man, as by slow melting they might release water for power and for irrigation, and thus become the industrial lifeblood of human communities in the valleys below.

The Wharton School freshman who has had physical geography in the preparatory school takes an alternative course in political geography, which, with the same human element uppermost shows how the physical facts of the earth have moulded man's actions along the lines of government and communal activity. The course, as it covers the leading countries of the world, becomes a course in what might be described as comparative geography. Each nation is studied with respect to the influence which physical environment has played and still plays in the trend of national activity both in domestic and foreign affairs. Natural resources, economic, industrial, social and political conditions are correlated with this geographic basis. This course is also elected by a considerable number of upper classmen, as giving a broad understanding of the world.

The one professedly sophomore course is the ecomomic and commercial geography of the United States. This country is studied from end to end so that the student may know what kind of a place it is from the standpoint of making a living, and the support of modern communities.

This requires some understanding of the chief economic requisites of modern life and the real importance of each. Incident to this is an understanding of the main features of agriculture, the problem of the abandoned farm, the influences creating rural land values, the introduction of new and useful plants, the reclamation of now useless lands, etc. Much emphasis is given to a discussion of resources, and the resources of particular regions, and to the reasons for the exchange of commodities between the different sections of the country. A larger application of this idea is the study of the main lines of our foreign trade and the underlying geographic causes that have produced it.

This course is considered to be generally introductory to much of the work of the two later years. It is plain that such an understanding of the resources and industrial possibilities of the United States is of value to the student of transportation, commerce, banking, accounting, manufacturing, political science or sociology. It is also directly introductory to a course upon the economic conditions in South America, and to a course in American industry. This last named course is a direct continuation of the economic geography of the United States and takes up the leading industries of the country for minute, careful and philosophic examination.

Another course articulating with the economic geography is that dealing with international trade which is gone into in such a way that the student may have some appreciation of the main factors that compose it, the routes over which it passes, the markets where it is handled, and the organization by which the work is accomplished.

In the whole group of courses that may be classed as geographic and partly so, the one that comes the nearest to pure geography is the course on climate. This is an elective, requiring as its minimum preparation the freshman physical geography. It takes up the leading climatic factors one by one, and goes at length into their economic responses.

Up to the present time the graduate school gave the only access that women have had to the geography work in the University of Pennsylvania. With the opening of the year 1907-08 the new college courses for teachers open the university doors to women and to teachers. Among the courses offered will be one in geography. The one selected as being of use to the greatest number of teachers is a special course in physical geography which will give the grammar school teacher an opportunity to see living geography through acquaintance with the physical geography of the vicinity. It is one thing to tell the student that land forms are thus and so and it is another and much better thing to go out and show the land form and then generalize and extend the teaching to the whole country and the world at large. For teaching of this kind Philadelphia is surprisingly well situated, when one considers that it is not in the midst of heroic landscapes. A short distance on one side are the marshes, mud banks, meandering streams and flat plains of the recent formations in New Jersey. Within the city limits are gorges carved in old plateaus of the most ancient rocks. The wide ramifications of cheap trolleys and many local trains give the teachers classes a splendid opportunity to refresh and extend their physical geography with illustrations from the real earth which will be of benefit to their own class-room work.

In the past year over 200 students were enrolled in the prescribed and elective courses in geography, a larger number than in any other university in the country. The strong emphasis placed on the human side of geography has advanced the subject both in interest and in value. This method is the turn which all teaching of geography must take in the near future, in schools as well as in colleges. The trouble in the past has been that geography was either not taught at all, or it was taught by persons not primarily geographers. The subject even now in many quarters is regarded as of secondary value, and hence can be taught by anyone as a side line. It is rapidly attaining recognition, however, and at the same time there is the realization that it must be taught with a purpose by a teacher thoroughly trained in the subject. Geography courses with this aim in view have already been firmly established in the University of Pennsylvania, their value being attested by the fact that they rank among the most important in the curriculum.

OBITUARY.

In the sudden death of Professor Angelo Heilprin the Society has lost one of its most distinguished and most zealous members. At the same time the country has lost one of its foremost scientists and prominent scholars; a loss which will be felt by all and especially by those whose good fortune it was to come under the influence of his enthusiasm and devotion to the world of science.

Professor Heilprin's scholarly qualities came to him as a birthright. His father, Michael Heilprin, a close friend of the great Kossuth, stood among the leaders in the Polish struggle for independence. The Heilprins for many generations had been learned men, distinguished in the field of Hebrew lore. Coming as he did from such a long line of able ancestors, it was only natural that the young Angelo should possess exceptional ability.

Angelo Heilprin was born on March 31, 1853, in the little town of Satoralja-Ujhely—picturesquely situated at the base of a vine-clad spur of the Carpathians, some thirty miles southeast of Kaschau, Hungary. But he was scarcely three years old when the family, in their exile from Poland, went to England and then to America, arriving in this country in 1856. In his youth, his interests rightly enough turned toward books, and particularly toward the field of natural sciences. Geology proved to be the chosen subject, and in 1876 he went abroad to complete his education. During the two years following he studied at the Royal School of Mines, in London, at Geneva, and at the Imperial Geological Institution of Vienna.

Returning to this country, Heilprin at once became prominent in scientific circles. In 1880 he was made Professor of invertebrate paleontology and geology at the academy of Natural Sciences, Philadelphia, a position which he occupied for twenty years, when he severed his connection there to accept a chair of geography at Yale. Between 1883 and 1892 he was executive curator of the Academy, and from 1885 to 1890 he held the title of Professor of

Geology at the Wagner Free Institute, Philadelphia. Professor Heilprin was also the founder and first president of the Geographical Society of Philadelphia, an organization in which he always manifested the keenest interest, and of which he was one of the chief benefactors. It is with the deepest regret and sorrow that the Society mourns his death.

In addition to his academic duties few men have been more active than Professor Heilprin, both in carrying on investigations in the field and in scientific writings in the realm of geology and geography. Of nervous temperament, making him an indefatigable worker, he was always deeply interested in some problem. In 1886 he made a careful study of the Florida peninsula. Two years later he was exploring the central plateau of Mexico; in 1890 he made a survey of the Bermuda Islands; and in 1892 he was leading the Peary Relief Expedition. But in spite of the time spent in these travels in many directions his studies had been carefully elaborated in a series of books, including: Contributions to the Tertiary Geology of the United States; Town Geology; Geographical and Geological Distribution of Animals; Animal Life of our Seashore; Geological Evidences of Evolution; The Bermuda Islands; Principles of Geology; and The Arctic Problem. Always a ready speaker, he possessed also the faculty of infusing into his books the rare quality of being both readable and scientific.

Professor Heilprin's latest works, on Mont Pelée and Martinique, and his edition of Lippincott's Gazeteer, must be reckoned among his most valuable and lasting contributions. A monumental work, like the Gazeteer, in which his brother was also associated, could be the product of none but a masterful mind. It is a work which will long stand as a silent tribute to the ability of him who guided its building.

Professor Heilprin, as his life work shows, was a man of creative mind, clear vision and untiring activity, attributes which placed him at the front in all his endeavors. His whole energy was always devoted to the realm of earth study, and to his love for it his death was indirectly due—shattered health from tropical fever contracted in the forests of Venezuela. Our Society mourns a most loyal friend and earnest worker. With the memory of him must always be associated our profound respect for the scholar and the man.

NOTICE.

Out of respect to the memory of our honored member, the founder of our Society, Professor Angelo Heilprin, the autumn excursions of the Society will be omitted.

ALBA B. JOHNSON,
President.

NOTICE.

The Publication Committee wish to announce to the members of the Society and to subscribers to the BULLETIN that the BULLETIN will no longer be issued in its present form. The plan for the future publications of the Society will be announced shortly. The Committee desires to express its appreciation of the co-operation received from members and outside contributors to whom much credit is due for the successful publication of the BULLETIN during the past two years.

WALTER S. TOWER,
Chairman.

ERRATA AND ADDENDA, VOL. 5, No. 3.

Page 6, author's title, for "Geography" read "Physiography."

Page 7, line 1. For "Colorado Plateau" read "San Francisco Plateau."

Page 7, line 9. For "Ever winding" read "Ever widening."

Page 11. The notes on recent vulcanism in other localities should include a reference to a paper by Professor R. S. Tarr, on "A Recent Lava Flow in New Mexico," Amer. Nat. 25, 524-527, 1891.

Page 56, line 32. Read May 18.

Page 56, line 33. For "Scott" read "Wm. S. Libbey."

Page 56, line 36. Omit "Historic."

Page 56, line 37. For "Scott's" read "Libbey's."

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THE BULLETIN

OF THE

GEOGRAPHICAL SOCIETY OF PHILADELPHIA

VOL. V, NO. 4

OCTOBER, 1907

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The Objects of the Society are to promote the science and study of geography, to assist in geographical exploration, to provide its members with a well-selected library of works on geography, to provide for lectures by prominent geographers, to enable the members to give each other the benefits derived by travel at home and abroad, and to publish a Bulletin containing carefully selected geographical literature.

The Meetings of the Society are monthly and inter-monthly. The monthly meetings held on the first Wednesday of each month from November to May, inclusive, are addressed by prominent geographers, and are intended to keep the members informed regarding the advance being made in the knowledge of the world and the science of geography. The inter-monthly meetings are smaller and less formal gatherings addressed usually by members of the Society, each program consisting of two or more twenty-minute talks. The reception following the address at the monthly meeting constitutes an enjoyable social feature of each meeting.

The members of the Society meet each spring for an annual subscription dinner. There are also occasional afternoon receptions held in the rooms of the Society, at which are shown special collections of photographs and other objects of geographic interest.

Excursions. In the spring and autumn a series of excursions is arranged by a committee appointed for that purpose. These afternoon walks or all-day outings to nearby places of scenic or historic interest have proven to be a most popular phase of the Society's activity.

The Library of the Society is well housed at the rooms of the Society, 1520 Chestnut street, which are open each week day from 9.30 a. m. to 4.30 p. m. The collection is well catalogued and contains, in addition to works of travel and reference, a large number of American and foreign periodicals relating to geography and kindred subjects. For the benefit and information of prospective travellers, a set of guide books relating to various countries, and a list of steamship sailings and railway publications have been collected and are kept up to date.

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OF THE

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